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EDITORIAL NOTES.

The Southern District Meeting.

THE Southern District Association of Gas Engineers and Managers held their annual meeting last Thursday at their new quarters, the Cannon Street Hotel, and, whether it was due to the change or to some other attraction, the attendance, both at the meeting and the subsequent dinner, was larger than ordinary. Mr. W. E. Price, of the Hampton Court Gas Company, the President of the Association for the year, was in the chair, and delivered the excellent Inaugural Address given in another column. Mr. Price is one of the younger order of gas engineers and managers, and enjoys a good reputation with his professional brethren, which will be enhanced by the sterling good sense with which his address is instinct throughout. Without going into details, or putting forward the speaker's own doings, the address is a successful expression of the thoughts which are actually moving the minds of active members of the gas engineering profession, which is a sufficient encomium. If there is one part of it that we should like to commend more than the rest, it is Mr. Price's thoughtful pronouncement, first, on the nature of the preparation desirable for aspirants for professional employment, and, secondly, on the importance of such employment being freely given to young men. It is quite true that, in England, excessive respect is paid to experience as a qualification for the holding of responsible office. Conversely, it is apt to be forgotten that there is such a thing as too much experience. Boards of directors and corporation committees are usually composed of elderly gentlemen, who have generally grown old together with the principal men with whom they do business. It is natural that such men should set great store by experience. But it does no harm, and may do good, to remind them that it is quite possible for the fruits of the experience of the old to form the basis of the knowledge of the young. That is what teaching should do; while training is bringing out and strengthening all that is good in the learner on the executive side. In America, it is said, those who have business appointments to bestow set small store by experience. They declare they have little use for it. Aptitude, ability, and character are what they want.

A very instructive illustration of what is meant by this breaking away from the old-fashioned rule of competency for responsible employment is afforded by the contemporary development of the electrical industries under the spirited direction of young men. There were no experienced men to be had for this employment. Yet we venture to say that, so far from the electrical interests having suffered from the necessity for entrusting very young men (almost lads) with responsibility for carrying out work, this is almost the only condition under which it could have made the headway it has done. Its young electricians and engineers are the glory of the profession of electrical engineering; and it would be well for other British interests and industries if the same could be said with equal truth of all of them. The best thing to do with our boys—to answer the common inquiry on this subject—is to make men of them. This can best be done by giving them men's work to do as early as they are able to do it; not by keeping them eating their hearts out in hopeless subordinate positions until all the best of their energies has evaporated or gone stagnant. Then, when in the fulness of time such men have acquired experience, their equipment will be valuable indeed.

The rest of the time of the meeting, after the Presidential Address had been read and the due acknowledgments paid, was devoted to the subject of naphthalene. This topic has now become appropriated by the Southern District Association, and it threatens to be a by-word among the members. Nobody spoke at the meeting without mentioning it; and it is to be most devoutly wished that the response of the heads of gas undertakings in the district will be sufficient to enable the Committee to discharge their souls of the burden they have come under in this respect, or it will be difficult to state the consequences. Naphthalene will block the Association as it too often does the pipes overlooked by the members. Jesting apart, however, there can be no disputing the truth that, where this common gas manager's bugbear exists, it is a greater hindrance to the gas business than all other technical troubles put together. If there is one thing more certain than another among the conditions that tend to make the conduct of a public supply undertaking popular, prosperous, and profitable, it is constancy of the service. If the organization which offers the public a service, no matter of what kind, can guarantee that under no conditions short of an Act of God shall the service fail, then that promise constitutes the first foundation of a successful business. If, on the other hand, there must be interruptions, especially of such a character as the user or consumer can neither understand nor co-operate in avoiding, then the public will never take so kindly to the arrangement as they otherwise would do.

Here, again, the man of "experience," and of little else, is apt to prove a drag upon the wheels of progress. If he knows nothing personally of the naphthalene trouble, he will be apt to stand aloof from all concerted effort aimed at its removal. If he is familiar with the evil, in his case familiarity will probably have its proverbial effect, and he will think that what always has been is likely to continue for his time. It is difficult to persuade those technicians who do not already see the point, of the enormous mischief that is wrought by naphthalene stoppages and by partial obstructions. The complaints made by consumers as to "bad gas" are, with few exceptions, directly traceable to this cause; and when a powerful municipality will put forward a small sweetstuff-shop keeper's complaint of his supply, as adequate reason for attacking the gas company in Parliament, it is easy to understand how costly a few naphthalene stoppages may prove to a gas undertaking. Mr. Charles Carpenter's arrangement of reversible condensers was the peg upon which the discussion was hung on Thursday; and of the merit of the device, where the condensation is carried to the point of throwing down crystalline naphthalene in the condensers, there was no question. Another view of the subject was stated very takingly by the President—that this condensation might conveniently be arranged for in an auxiliary piece of apparatus specially appropriated to the purpose. This observation suggests that perhaps English gas engineering has in the past been open to the criticism of trying to do too many different things with too few pieces of apparatus. The processes have been too much lumped together for it to be exactly known what was really going on inside. It makes for clearness to give every piece of apparatus its proper work, and see that it does it. How far this method of subdivision can be profitably carried, must always remain a point within the discretion of the engineer, guided by circumstances.

Crooked Committee Work in Liverpool.

THE "unpleasantness" at Liverpool, with regard to the description of gas supplied by the Liverpool United Gas Company, has not diminished in virulence since the Corporation went into the electric light business. It may, of course, be only a coincidence; but the fact remains that recent proceedings of the Electric Power and Lighting Committee of the Corporation include references to the Gas Company which can only be compared for spitefulness to the comments of an angry woman suffering from that scorn of her own attractions which has always led to trouble. It seems an odd arrangement that a Special Sub-Committee of the Electric Power and Lighting Committee should be charged with the task of inquiring into the supply of carburetted water gas in the city. Either this is a Committee engaged in trade or it is not. Nobody would take the latter view of its operations. It must therefore be regarded as a trading body, whose interest in the business committed to its control is mainly commercial. Why, then, such a Committee should be required to exercise semi-judicial functions over a commercial rival, is not easy to perceive. There is, it appears, a Health Committee of the Liverpool Corporation, who, one

would think, might have been set to work on the gas question if it was a point of sanitation At any rate, even in the absence of specific injury to the health of Liverpool, which is nowhere alleged, a show of interest in the recommendations of the Home Office Committee on carburetted water gas would have come better from the Health Committee than from a Committee which "keeps shop" in a competing commodity. However, it is proverbially idle to dispute about matters of taste. There is, nevertheless, a point of law lying somewhere near this favoured procedure of the Liverpool Corporation, to which possibly the attention of the Town Clerk has not been directed. A Committee of the Corporation could only interfere in an affair of this kind by virtue of its delegated powers under the sanitary authority. If the Health Committee is weak or otherwise useless, the authority might possibly be exercised by any other Committee. We cannot offer an opinion upon this point; but we do remember that when the Walker Urban District Council wanted to set in motion their powers as a Sanitary Authority for the particular purpose of hampering the proceedings of local rivals in the electrical trade, the Court made some strong observations upon the point.

The story of this very peculiar Liverpool Corporation Committee's proceedings was given in their report, which we published on Jan. 28 last. It is told there how the Health Committee began it in 1898, and how the work of worrying the Gas Company was taken over by the Electric Lighting Committee last year. Their official scribe expressed the "surprise" of the Committee that the Board of the Gas Company had declined to discuss the Home Office report with them. How singular! This Committee seem to have imagined that the report was addressed to them. The Secretary of the Gas Company politely pointed out, in answer to their absurd remonstrance, that the Home Office report could not bear upon them or any other gas manufacturers, till it was embodied in legislation, which must be promoted as a Public Bill. Such a small detail as that would be very likely to escape the Electric Light Committee, who were not appointed, one would suppose, for the sake of their competent knowledge of the law of gas supply.

The Electric Lighting Committee did not take their snub kindly, but moved the Corporation to permit them to ask the Home Secretary to receive a deputation, with the object of urging upon the Government the desirability of introducing a Bill in Parliament carrying out the recommendations of the Departmental Committee. It seems a roundabout way of promoting the electric lighting business in Liverpool, at the expense, if possible, of the Gas Company. The Corporation evidently have plenty of money to throw away. We notice that one member protested that he did not want to go to London at the expense of the ratepayers. Then, why go? How much attention does anybody think the Home Secretary is likely to pay to a deputation of so questionable an origin, with only a Liverpool axe to grind? There is a great deal more carburetted water gas sold in London, and served up for the consumption of Ministers in Whitehall itself, than they know anything of in Liverpool. The statements made in the Liverpool Council meeting in support of the proposal of the Electric Lighting Committee to go and enlighten the Home Office, do not give one a very high opinion of the ability of the speakers to carry out their own programme. One speaker talked airily about the Corporation being able to supply gas at 1s. 6d. per 1000 cubic feet if they had the works—a subject on which Alderman Forwood had something to say a long time ago. The same speaker is reported to have said that "the Council knew "that the water gas was cheap, because Widnes supplied "very nearly the same quality of gas at 1s. 6d. per 1000 "cubic feet." This is a sample of the collective wisdom of Liverpool. According to what a medical member of the Corporation said, the gas supply must be a boon to the faculty in Liverpool; for when they do not know what else to call an illness, they put it down to "the escape of this "deleterious gas." A disease that does not get into the mortality returns is an unspeakable comfort for doctors. Another member, according to our report, seems to be very truculent. He wanted to see the population of Liverpool reduced by the Company's gas. "He contended that no "gas ought to be used in this enlightened age." So we know where he is; which is satisfactory. An honest enemy such as this total abolitionist gentleman is preferable to a pretender who professes solicitude for the public health, while all the time he has designs on the public pocket. Perhaps the Liverpool Corporation even now will give heed to the old saw, that suitors for justice should have clean hands. It will be well for the Corporation, in making up their deputation, to decide beforehand whether its composition shall represent to the Home Secretary solicitude for the public safety, or greediness after electric lighting profits. They are not exactly simpletons at the Home Office; and questions put to deputations are sometimes disconcerting.

Conference on the Price of Gas in the Northern Area of the Gaslight and Coke Company.

The conference called on the initiative of the London County Council, with the object of discussing once more, with the local authorities interested, the price of gas charged by the Gaslight and Coke Company in that part of their district which lies north of the Thames, was held on Friday; and the proceedings will be found reported at considerable length elsewhere. The Chairman of the Council presided, as though to indicate the importance of the occasion. He was supported by the Chairman of the Public Control Committee of the Council, who moved a resolution declaring the price of gas now charged in the region already named excessive, and a burden upon the consumers. This high personage could not claim much knowledge of the subject; being fain to confess that he had only the day before learnt of the length to which in 1883 the Gaslight and Coke Company proposed to carry their policy of amalgamation. The official resolution did not amount to anything, and was duly carried. Next a proposal was brought forward that, inasmuch as the Gaslight and Coke Company had exhibited contumacy, and had no apparent intention of doing anything to reduce the existing discrepancy between their two prices for the same gas, Parliament should be asked to take in hand the task of doing something to protect the consumers. There was the usual talking in the air round and about this suggestion. A fervid speaker declared they ought to go to Parliament and "demand their rights," whatever these rights might be in the circumstances. Mr. A. C. Morton thought the occasion suitable for an attack upon the County Council for ignoring the Corporation of the City of London. It was agreed to ask the President of the Board of Trade to receive a deputation to urge the desirability of legislation applying to the case of the Company being initiated by Government. In the not unlikely event of the Government not seeing their way to taking such a step, it was agreed that the County Council and the Corporation, with the Borough Councils, should take action. The conference made it clear that they did not favour the transfer to the South Metropolitan Company of the portion of the Gaslight and Coke Company's district south of the Thames; so that this unfortunate suggestion of Sir James Rankin's Committee may be regarded as dead and buried. How the Gaslight and Coke Company are to sell gas for 7d. per 1000 cubic feet less than the actual price, and pay a dividend, was one of the puzzles which the conference tacitly gave up.

The Illuminating Power of Southport Gas.

The Local Government Board inquiry held at Southport last January to consider an application of the Corporation for sanction for the reduction of the illuminating power of the gas supply on conditions, has resulted in the permission being granted, substantially as asked. The case for the proposed reduction was agreed beforehand; and the Board were merely asked to consent to a change from 20 candles to 16 candles, with the possibility of a further reduction to 14 candles, by agreement between Southport and Birkdale. The terms of the new settlement will be found set out in another column. It is calculated to compose for good and all a source of irritation which has already existed far too long. At the same time, the Department has not permitted the parties to have it all their own way. Instead of making the new standard of illuminating power as asked, it has been decided that the gas shall be sent out of 15-candle power, which is in accordance with the model provision. This decision is a triumph of the official mind that conceived its terms. It does not commit the Department to anything new, and explicitly saves the new order from ranking as a precedent. As a matter of fact, what is done is to relieve the district from the obsolete obligation to send out gas of an extravagantly high illuminating power; but it does this by bringing the gas undertaking into line with others throughout the kingdom. The Department has frowned upon any

experimenting with Mond gas, or anything newfangled of this nature; and whenever a still cheaper gas is desired, the locality must come and ask for it in the regular way. No private agreements to vary the terms of an Order are encouraged. After all, this "saving of the official face" is a matter of form. The main point is that the light of reason, in regard to modern gas manufacture, having been shed upon Parliament, has also been let into the Local Government Board; and it will increase and spread.

Conversions of Stocks—A Warning.

THE judgment of the House of Lords in the case of *Midland Railway Company v. Attorney-General* (delivered on the 25th ult.) should be noted by all companies contemplating a conversion or consolidation of their stocks and shares. The case was an appeal from an order of the Court of Appeal confirming a decision of the Queen's Bench Division, whereby the Midland Railway were held to be liable to pay to the Inland Revenue duty upon the increase brought about in their nominal share capital by the conversion and consolidation of their stocks authorized by the Midland Railway Act, 1897. The whole point at issue was whether such an increase in the capital of a company, whereby the company obtains neither additional capital powers nor a penny of actual additional capital—in short, the process of "watering" stock—constitutes an "increase of the amount of nominal "share capital" of that company, within the meaning of section 113 of the Stamp Act, 1891. The section provides:

> Where, by virtue of any letters patent . . . or any Act, the liability of the holders of shares in the capital of any corporation or company is limited otherwise than by registration with limited liability under the law in that behalf [section 112 deals with companies registered under the Companies Acts], a statement of the amount of nominal share capital of the corporation or company shall be delivered . . . to the Commissioners within one month after the date of the letters patent or the passing of the Act; and in case of any increase of the amount of nominal share capital of any corporation or company . . . a statement of the amount of any such increase shall be delivered . . . to the Commissioners within the like period.

It also provides that such statement shall be charged with an *ad valorem* stamp duty of 2s. (now 5s., *per* Finance Act, 1899) for every £100 of such capital or increase of capital; also that, in case of neglect to deliver such a statement, the company shall be liable to a fine of 10 per cent. per month upon the duty payable.

The House of Lords has held that the increase of over £59,000,000 in the nominal capital of the Midland Railway Company, brought about by the conversion of their stocks, was an increase within the meaning of the section just quoted; and, while it is open to doubt if the framers of the Stamp Act intended the section to apply to such cases of mere "paper" increases, it is very difficult to see how, in the absence of any clause in their Special Act, the Midland Company expected to obtain exemption. The moral of the case appears to be that any company going to Parliament for power to convert and consolidate their capital should insert a clause expressly exempting from duty any increase thereby effected. It was presumably for this purpose that section 6 (2) of the Gaslight and Coke Company (Capital Consolidation) Act, 1898, provided that, except to the extent of the increase thereby authorized in the nominal amount of the Company's unissued capital, nothing in the Act should "be construed as authorizing any increase of nominal share "capital of the Company"—a wise precaution on the part of the drafters of the Bill.

The Need of Energy and Enterprise.

ALL observant Englishmen who visit the United States—of whom the latest well-known man is Sir Christopher Furness—are struck with one very marked characteristic of the business man on the "other side." That is the keenness with which he seeks and pursues business. He does not merely open a shop, paint his name over it, and then quietly sit behind the counter and wait for orders. He takes every opportunity, in season and out of season, to impress the fact of his existence and the superiority of his goods upon the minds of his fellow townsmen and women. Quick to grasp opportunities, acute in foreseeing the needs of the world of to-morrow and energetic in supplying them, the American merchant, as one who has been visiting him said recently, does a thing twice while the Englishman is contemplating doing it once. This pushfulness, wakefulness, acutely-directed energy, have been pointed out once more by Sir Christopher Furness in an article in the current number of the "Pall Mall Magazine;" and we do not wish to miss the opportunity of again urging upon the gas industry the need of acquiring more and more the modern spirit. Some business will come to every gas undertaking—enough perhaps to keep it going in a modest way—if nothing is done to induce the public to burn gas. But what proportion will the output (and the profit) thereby obtained bear to the output (and the profit) that may be achieved if everything possible is done to show the public how to use gas most economically and most effectively, and to persuade them to give it a trial for any of the purposes to which any of them have not as yet applied it? The remarkable results achieved by the Lea Bridge Gas Company, as set out in the "JOURNAL" a fortnight since, help to supply the answer.

There has been in the past, there still is in some quarters in the gas world, an all too deeply-rooted aversion from the methods of ordinary business concerns—too prevalent an idea that a gas company was rather on a par with the local authorities (not to mention "Departments of State") than with trading establishments such as Lipton's, or Whiteley's, or Harrod's. Rather above the banker, and first-cousin to Bumble, has been the assumed position of some gas managements, who have looked upon anything approaching the accursed thing, "Advertising," as something too unspeakably vulgar and *infrâ dignitatem*. That is just the spirit that needs to be exorcised if gas is to maintain and improve its position, as we believe it can and will be improved. We must get rid entirely of the idea that the gas company is conferring a favour upon the public by supplying them with just so much gas as the public may ask for. Gas companies have to persuade the public that it is to their benefit to use more gas, and must not neglect an opportunity of presenting its advantages in the most favourable light. If they are to lose no such opportunity, not only must judicious and well-timed advertising be carried out, but every member of the companies' staffs who comes into contact with the public must be a trained *vivâ voce* advertiser, and must be made a co-partner in the prosperity of the undertaking he serves. He works best who works for himself, and not for a soul-less corporation. But whatever system be adopted for taking gas to the consumer, instead of waiting for him to come and ask for it, it is very certain that the days when gas companies could afford to sit with closed eyes and open hands have gone, never to return; and we, at any rate, do not regret the fact. There is more to be proud of in prosperity that is founded upon efficiency than in prosperity founded upon monopoly.

The Mines (Eight Hours) Bill Rejected.

WEDNESDAY of last week was wasted, as many previous days have been wasted, in discussing in the House of Commons the Mines (Eight Hours) Bill, 1902. This is one of the very hardiest of the hardy annuals that fill the hours of private members' days. Sometimes it passes the second reading; sometimes (as on the present occasion) it does not. The theory of the Bill is one thing; its origin as an effort at legislation is another matter. Whatever there is to say about its provisions, for or against, the truth about it is that it is an attempt of the Miners' Federation, and the politicians who are usually found acting with the leaders of this organization, to dictate to the North Country coal miners, who will have nothing to do with it. If the Bill could but be carried, it would be trumpeted abroad as a Federation victory; and this, of course, the Northern men do not desire. Besides, they do not need it. This has been made abundantly clear time after time; but still the pedants of Trade Unionism and their associates—the politicians who are always taken with the idea of legislation "on principle"—keep on pushing it forward. This persistence may be styled perseverance or obstinacy, according to the point of view. What it never fails to exhibit, however, is something that one would think the Miners' Federation would be glad to keep out of sight—the irreconcileable division of the miners of this country on this important subject. It seems to be an elementary proposition that Parliament will never force a law on half the followers of an industry at the instigation of the other half; but politicians who are so glib about their "principles" do not perceive this one.

It is another indication of the undesirability of such a measure that neither those who support nor those who oppose it are of one mind in regard to its probable effect

upon the output of coal. The Miners' Federation passed a resolution declaring that it would increase rather than diminish the output. The impudent hypocrisy of such a declaration becomes apparent when it is remembered that these Trade Unionists are the very men who counsel the restriction of the output by all and every means, with the express object of keeping up wages. One can easily judge from their record whether they would likely be the persons to suggest anything calculated to advance their pet aversion. Rather is it obvious that the real attraction of the scheme to men of this way of thinking is the practical certainty that the amount of coal won per shift would be diminished by perhaps 20 per cent. Then they would engineer one of the finest strikes of their generation to prevent a corresponding reduction of wages. So, they flatter themselves, the price of coal would be permanently kept up against the consumer. For such a visionary reward, these men, and the liberty-loving politicians of their tail, would make this country a laughing-stock by rendering it felony for an able-bodied man to work more than eight hours a day. It would be a criminal act for a miner to stay down in the pit for another hour, if he were so minded, in order to get a longer time off to attend to the serious affairs of his life—his rabbit-coursing, and so forth. Truly, there is none so unpractical in politics as your practical man, and none so arbitrary as a delegate of a free people.

The Standards Department and Meter-Unions.

It may be remembered that the "JOURNAL" for the 22nd of October last contained a letter from Mr. Walter T. Dunn, the Secretary of the Gas Institute, stating that he had received from Mr. H. J. Chaney, the Superintendent of the Standards Department of the Board of Trade, a communication to the effect that the set of standard meter-unions in the possession of the Board had been measured and verified, and enclosing a note of the actual sizes of the gauges, which were appended to Mr. Dunn's letter. We learn that a paper has been prepared, and will be circulated in the course of a few days, giving particulars of the sizes in tabular form, with illustrations of the standard measures, as well as of the ordinary brass unions employed in connection with gas-meters. The Department will be prepared to verify, for gas engineers and meter manufacturers, sets of gauges of which the dimensions do not differ from the standard set by more than 0·01 inch.

The Eastbourne Coal Contracts.

When referring last week to a somewhat undesirable contract into which the Eastbourne Gas Company unfortunately entered at the time of the coal famine two years ago, we remarked that the Manager (Mr. John Hammond) "apparently lost his head a little" with regard to this matter. Mr. Hammond, however, states that this is far from the truth, and that our remarks do him a serious injustice. It is impossible for us to rest under the imputation of doing anyone an injustice; and we therefore hasten to explain that the words to which exception has been taken were not our own, but were contained in what purported to be a first-person report of a speech made by Mr. Worley (the Company's Auditor), who should have known the circumstances of the case. Singularly enough, in a reprint of another report (also purporting to be a verbatim one) of the proceedings, which Mr. Hammond has forwarded, these exact words do not appear, but precisely similar ones do—namely, "the Manager took fright," and "he was at his "wit's end trying to get coal for future use." The coal referred to in the contract in question was not needed before the time when the price had fallen heavily; and the cancelling of it cost the Company £3500. It therefore proved to have been a mistake to enter into the contract at a time of such high prices, seeing that none of the coal was immediately required; but neither we nor the Directors, whose entire confidence Mr. Hammond enjoys, attribute the smallest particle of blame to him for this error of judgment. As we remarked last week, at the time the contract was made it was impossible to tell to what price coal might go; and it was the fact that the vast majority of coal buyers were seized with a sort of panic, and refused to postpone the settling of their usual contracts, which was largely responsible for the price going as high as it did. From the explanation that was given at the meeting by the Consulting Engineer (Mr. H. E. Jones), it seems that it had been the practice of the Company to secure enough coal to carry them on eighteen months; and the cancelled contract was made on this footing. But, owing to the introduction of an oil-gas plant, about 10,000 tons of coal were saved in the year. Therefore the low-priced contract lasted through a period when other people were paying 8s. a ton advance; and the Company came on their period of high prices when coal in the open market had fallen. However, "all's well "that ends well" certainly applies in this instance; for, while gas undertakings all over the country were raising the price of gas, the Eastbourne Company did not do so, and moreover have continued to pay the full statutory dividends without encroaching on the reserve fund. This is an achievement upon which all those who are connected with the management of the Company may justly pride themselves. With regard to this matter, we would further remark that a letter from Mr. Jones (to which we gladly give publicity) appears in our "Correspondence" columns to-day. Mr. Jones confirms to an extent what has been said on the subject, but explains the circumstances.

The Milch Cow at Belfast.

The Belfast City Council, like the Chancellor of the Exchequer, have been anxious to find a fresh source of revenue; and they have, as might easily be guessed, hit upon the gas undertaking as a suitable object for their attentions in this regard. They are to make a start with the substantial sum of £15,000; but, of course, there is no guarantee that the demand will stop at even this figure—which, again, is in addition to £5500 which will in other ways be taken this year from the gas fund in relief of the rates. The Lord Mayor said that if the profits should not be sufficient to meet this tax, the remedy would be to raise the price of gas; and if this should unfortunately become necessary, the consumers would be justified in complaining that they are, besides contributing their own share, being called upon to help pay the rates of those who do not use gas. Of course, there is no reason why anyone should have gas at less than cost price; but if about £21,000 a year is to be taken to relieve the burdens of the taxpayers generally, it is clear that someone must pay considerably more than the gas really costs to produce. Though in past years the city may not have been getting very much (if any) direct benefit from the great success which has attended the operations of the undertaking, the manufacturers have done so, by the cheap rates at which they have been supplied with gas; and seeing how much Belfast depends upon the continued prosperity of these firms, anything which aids them in maintaining their supremacy must be of great indirect benefit to the city.

Parliament and the Welsbach Company.

As our "Legal Intelligence" columns have recently shown, the litigation floodgates of the Welsbach Company have not yet been closed; but it is hoped that what we now see is merely the clearing up of the *débris* left by the former administration, and that the new direction will devote themselves exclusively to the contest which is to settle once and for all whether they have any legal property in the much assaulted 1893 patent. The actions, motions, injunctions, and even (it is stated) committals which have been taken and made in the name of that uncontested patent are legion; and supposing after all—after many people have suffered and suffered in many ways—the patent should be declared invalid? It is hardly a nice thing to think about in this light. But such thoughts will arise; and, in connection with them, it occurs to one that it is a funny world which gives no recompense in such an event—no recompense for punishment which is ultimately proved to have been unjustly awarded. The patent, however, has not been contested yet; but next Thursday evening it is going to receive the dignity of an introduction to the House of Commons. Mr. Weir will then make a request that the Attorney-General grant a return of the number of writs issued by the Courts against persons alleged to have infringed the Welsbach patents since 1890, and against persons alleged to have infringed the 1893 patent since Jan. 1, 1901; of all applications for committal to prison, on the plea of contempt, of persons alleged to have infringed Welsbach patents since 1890 and since Jan. 1, 1901, respectively, of all orders made thereon, and names of persons arrested and committed; and of the number of manufacturers, dealers, and sellers of mantles who have been served with writs, prosecuted, or committed to prison on the

plea of contempt in connection with alleged infringement of the Welsbach patents since 1890, and since Jan. 1, 1901. We do not know what is Mr. Weir's ulterior object in asking for this return, nor can we see at present that any particular good can come from granting it. However, if he can get on the right side of the Attorney-General, the return will be of interest; and later on, if the Welsbach Company have to give up their claims to the 1893 patent, the return will bear witness to there being a terrible defect somewhere in our patent laws.

A Deficit at Halifax.

When the directors of a gas company find themselves compelled, owing to some extraordinary rise in the price of coal, or other cause, to raise the price of gas, the announcement is usually received with a howl of indignation by the consumers, and a clamour is raised by the members of the local authority for possession of the gas undertaking, in order that, by more able management, the price may be kept down and at the same time the rates relieved with the large surplus profits. That this pleasant condition of things is not always realized is apparent by what took place at the meeting of the Halifax Town Council last Wednesday, as reported elsewhere. The Chairman of the Gas Committee had what he frankly acknowledged was a "painful duty" to perform—to tell the ratepayers a "mournful story" about their gas-works. Briefly put, it was that they had incurred a deficiency of £11,365, instead of yielding a small surplus to be handed over in relief of the rates. Coal cost about £6000 more, and the income from the sale of gas was £3000 less, than the estimates. Consequently, the price would have to be raised 3d. per 1000 cubic feet both within and beyond the borough, with the present scale of discounts. A member of the Corporation questioned the policy of the Committee in embarking on expenditure to the extent of £40,000 in extending plant for making more gas if the consumption was not increasing; and he put in a plea for some consideration to be shown to large consumers. All he could get from the Chairman of the Gas Committee was a promise that a higher discount than that proposed in the new scale would be allowed if the Committee could see their way to doing so. Their present care is to make ends meet.

The Prevention of the Sale of Gas.

This was the curious title to a one-and-a-half column piece of pleasantry which appeared in a London evening paper on Saturday. The heading attracted our attention; and we read the matter following. At first we were perplexed. The writer referred to a Society for the Prevention of the Sale of Gas. With all our carefully devised system for obtaining information as to what is going on in the gas world, the Society in question had never come within the purview of that system. Reading on, it gradually dawned upon us that the Society whose object was to impede the sale of the useful commodity referred to was nothing more nor less than the Gas Company who place all sorts of obstacles in the way of people who desire to become consumers. In other words, it was merely a good-humoured tirade against the old-fashioned methods of some Gas Companies, who stick to an elaborate organization in their dealings with their consumers. There is a little story running through the criticism. A lady was smitten with a desire to have a gas-stove. The "Society" heard of it; and the great machine which they control was set going, and the prevention of the sale of gas began. An official visited the lady, and wanted a word with her nearest male relative. The lady replied that when she wanted a flat the landlord raised no such point; and when she wanted electricity, the Corporation had been alike dumb. The official intimated that he was only carrying out his painful duty. The lady then wrote to the "Society;" and a great correspondence ensued. After an interval, the Society informed the would-be consumer that if she would lend them the small sum of £2, they would see what could be done to effect a conjunction between her meter and the Company's main. The sum was forwarded; then the Society again wrote, and told the lady that she might call at an office on the extreme limits of the district and select a stove. This was done; and the Society once more wrote to say that they could not proceed without 3s. to cover the expense of fitting. Two months had elapsed since the idea of having a stove was conceived. Ultimately it was delivered; but, upon its being set down somewhat roughly on the stone prepared for it, one of its cast-iron feet snapped off. The carman had no order to remove it—only to deliver it. The lady again communicated with the Society; and an inspector called. Another week passed before a new stove was sent to replace the damaged one; but the day on which a tardy mechanic called to fit it, he bumped his head against the coffin of the poor lady on the concrete stairway. The moral of the tale is that but for the elaborate and ingenious organization of the "Society," that stove might have been fitted within a few days of their hearing of the demand for it. There is a good deal of humour in this piece of satirical composition; and some gas companies will recognize, even if they will not admit, that it also contains much truth.

An Expensive Dust Destructor.

The dust destructor which has been for some time in operation at Canterbury does not, judging from some remarks made at the last meeting of the Council, seem to have been an unqualified success. One of the members said that ever since it had been erected it had been a "white "elephant." Last year they spent £800 on it, irrespective of the repayment of loan and interest; while the year before they spent £600. The cost, he said, had been enormous; and, on the top of all this, they had a proposal to make an inclined plane at an outlay of something like £2000. Thus, while they were saving about £130 in coals for steam, it was costing them £800 to do so. As to the clinker and other stuff, the Lighting Committee would be very glad to get a customer for it. It is true all the members did not share in this very discouraging opinion of the performances of the "monster;" and a Sub-Committee has been appointed to prepare a report from a financial and a sanitary point of view. If these destructors are considered as a convenient means of getting rid of town refuse, then it becomes merely a question of whether this convenience is worth the expense incurred; but it appears to be altogether a mistake to regard them (as some people do) as a cheap means of raising steam for generating electricity or other purposes.

A Powerful Acetylene Light.

Some complaints have recently appeared in print with regard to the smell given off by the Phôs acetylene lamps which are now being used in the vehicles of the London General Omnibus Company. It is when the 'buses are at a standstill that the trouble is most noticeable; and the penetrative powers of the odour reach the inside as well as the outside passengers. The lamps are supplied under contract by the Phôs Company, who recharge each one every day. On being interviewed by a representative of the Press, the Secretary of the London General Omnibus Company stated that he had received no complaints from passengers, though he had heard indirectly that the drivers had been grumbling. He added that he had had some lamps burning in his office for days together, and had never detected any smell, except just for a moment after the light was put out. This sounds convincing; but the question is one that each Londoner can easily settle for himself.

WATER AFFAIRS.

The Progress of the Government Bill.

After being subjected to another severe "riddling" on Monday last week, the London Water Bill was read a second time, and left for the consideration of a Joint Committee of the two Houses. The debate was resumed by Sir Blundell Maple, who gave a kind of half-hearted support to the Bill, which he seemed to think might be made acceptable to the people of London if amended on the lines of the measure introduced by himself last session. He was followed by Mr. Asquith, who, in a speech of about an hour's duration, kept up an incessant fire at the Bill, the study of which had, he said, only filled him with bewilderment and confusion. Its two redeeming features were, to his mind, its recognition of the principles that the supply of water in the Metropolitan area is a matter of public concern, and should be in the hands of a public body, and that the machinery of the Lands Clauses Act, with the incidence of the bonus on compulsory purchase, is inapplicable in such a case. The public body proposed by the Government he characterized

as the most far-fetched, worst-equipped, and least-workable one that the wit of man could have devised; being viciously constituted on the principle of indirect representation, which really negatived electoral responsibility and popular control. The body which ought to have been entrusted with the management of the London Water Supply was, in the right honourable gentleman's opinion, the London County Council. Mr. John Burns followed in the same strain; contending that the Bill as drafted was nothing but an unjustifiable snub to the Council. Mr. Long, however, stoutly defended his "bantling." As to the size of the proposed Board, which had been attacked all along the line, he contrasted it with the Asylums Board, the School Board, and the Technical Education Committee. With regard to the criticisms as to the method of purchase, he thought the Government must have struck that happy middle path which was the safe and fair one between two extremes. He expressed approval of the remarks of Mr. Whitmore, who had said that by the transfer no one should be one whit the better or worse. In other words, common justice should and would be done as between the Water Companies and the public. As to the date of purchase, it could be so arranged that the Companies would have a reasonable time for the statement of their cases. Mr. Long concluded by announcing that while the Government would stand by the provisions of the Bill with regard to purchase and arbitration, they had no intention that the procedure under the arbitration clauses should be different from that of arbitrations under the Lands Clauses Act, and that if this was not clear from the language of the Bill, it could be made so.

Some discussion arose on the proposal to submit the Bill to a Joint Committee; Mr. Boulnois contending that to do this after only a second reading in the Lower House was practically to pledge the Upper House to a Bill before it had been submitted to them. There was certainly some justification for the contention. Moreover, the Water Companies might be prejudiced by being deprived of their right of appeal to the Second Chamber. Mr. Burns very frankly declared that he was induced to look with favour upon the suggestion, simply because the Companies' representatives regarded it with suspicion. Mr. Dillon, on the other hand, considered the proposal a most reactionary and retrograde one; and he therefore moved that the Bill be referred to a Select Committee in the usual way. Mr. Long, in defending his proposition, assured the House that all parties concerned would have an opportunity of presenting their cases before the Committee. Dr. Macnamara confessed that though he entered the House in favour of a Select Committee, he had become converted to the opinion held by the President of the Local Government Board, as it was clearly in the interests of economy and the businesslike carrying on of the further stages of the Bill that the course he suggested should be followed. The proposal was then agreed to by a majority of 73.

When the Committee is constituted, Colonel Lockwood will move that they shall be empowered, by an Instruction from the House, to provide for the compensation to the Water Companies being "ascertained and paid in the manner "recommended by the Royal Commission presided over "by Lord Llandaff," and to amend the Bill accordingly. Another matter with which the Committee will be asked to deal by means of the Bill will be the rating of reservoirs. Sir F. Dixon-Hartland has notified his intention of moving for an Instruction to them to insert a clause for repealing sections 211 and 230 of the Public Health Act, 1875, so as to make "reservoirs, canals, watercourses, and filter-beds, "artificially formed," within the area of the intended Act, liable for their full rateable value, instead of one-fourth as at present. Dr. Macnamara will ask that the Committee shall have power to confine the membership of the proposed Water Board, except in the cases of the Chairman and Vice-Chairman, to representatives of the county authorities within the area of the supply; and the County Councils of Middlesex, Kent, and Surrey will apply for much larger representation than that proposed, or none at all. In addition to these matters, an endeavour will be made by certain Local Authorities to obtain the insertion in the Bill of protective clauses in connection with the opening of roads.

It will be seen, therefore, that the Committee will have a task of some magnitude to bring into a satisfactory condition a measure which has given rise to so much adverse criticism on all sides. But it appears that, whatever other change may be necessary in their legislative programme, in view of the exigencies of financial business and of the time likely to be occupied in passing the new rules in regard to procedure, it is the intention of the Government to persevere at all hazards with the Water Bill. Should they succeed in placing it upon the Statute-book, they will have earned the credit of solving a problem which has for many years baffled politicians and municipal reformers; but whether its solution will prove to be advantageous to the public at large, is a question which can only be answered by time. This, however, is pretty certain—that the Water Companies will fare better at the hands of the Government than at those of the authority in Spring Gardens.

Cost of the Birmingham Water Scheme.

In another column will be found some extracts from a very important report which the Water Committee of the Birmingham Corporation lately placed in the hands of the members of the Town Council, and which came before that body at their meeting on Tuesday last. It deals with the cost of carrying out the first part of the scheme commenced about ten years ago for bringing a supply of water to the city from Wales; and its most salient feature is the announcement that the parliamentary estimates have been considerably exceeded. It was expected, by many people who had followed the progress of this great work, that this would be the case; and the purpose of the report is to furnish some explanation as to the causes of the excess. This the Committee have done, with the assistance of Mr. James Mansergh, who, as our readers are aware, is the responsible Engineer for the scheme. The parliamentary estimate for the first portion of the works was £3,755,350; and the present estimate (arrived at during January) is £5,884,918—thus showing an excess of £2,129,568. This, at first glance, is what a well-known character in fiction would have called a "staggerer." But the difference is very much reduced when one reads the detailed explanation given by Mr. Mansergh in his report. In the first place, a sum of £750,000 has been spent on land and works which were not in the original estimates; next, unforeseen difficulties occurred at the watershed; finally, during the progress of the works there has been a huge increase in the price of material and labour, but no corresponding extra output from the latter. Without going into details, which can be obtained from our extracts from the report, the excess which at first appeared so formidable is really less than 30 per cent. It will, however, have to be met out of the rates; for the water-rentals have reached the statutory maximum. The amount of the call will depend, in the first place, largely upon the success of the application now before Parliament for a further suspension of the sinking fund; and, secondly, on the cost of carrying on the new system as compared with the present working expenses of the Water Department.

It is to be supposed that in such a vast undertaking as that which the Birmingham Corporation have in hand circumstances should arise to call for an expenditure not contemplated at the outset; and, in justice to Mr. Mansergh, it must be stated that for some of the estimates he is not in any way responsible. As explained by Alderman Lawley Parker, the estimate in regard to the cost of the Frankley works was made by the late Mr. Gray; and although, as shown by the report, Mr. Mansergh was allowed to increase it by £75,000, this was only about half the addition he desired to make. Unfortunately, no specification could be found showing how Mr. Gray proposed to carry out the work. Alderman Parker told the Council plainly that he knew of no "mistakes or errors of judgment" that had led to any material increase in the cost of the undertaking from beginning to end; and even if the present cost had been foreseen, it must have been faced if the city was not to be subjected to a water famine, with all its disastrous consequences. He thought there could be no question as to the wisdom of the Council in carrying out the scheme. Mr. Walthall criticized the report of the Engineer, and complained that the Council had not been fully informed by the Water Committee as to the progress of the works year by year. Alderman Parker ably defended the Committee and Mr. Mansergh from the attack made upon them; stating that the latter had acted most fairly and unselfishly in this matter. The report was adopted by an overwhelming majority, as it was bound to be, though Mr. Walthall expressed his reluctance in voting for it. The lesson conveyed by it is that if ever a public body having the control of the water supply of London are seized with a desire to carry out a gigantic scheme for bringing it from Wales, it will behove

them to take very special care, when counting the cost, that the carrying out of their ambitious (and at present unnecessary) project shall not have the effect of placing additional burdens upon people in whose interests they have professedly been constituted.

The Duties of Local Authorities.

In view of the assertion which has of late been so freely made, that local authorities, and not private companies, should be responsible for the supply of water to the communities under their control, it is interesting to note the proceedings of two Councils who have lately been busying themselves in this direction—one against the wishes of a very large body of the ratepayers concerned, and the other, apparently, against its own wishes. The first of these was the Hollingbourne Rural District Council, who, having twice previously threatened to oppose schemes of the Mid-Kent Water Company for furnishing water to several villages now without a supply, on the present occasion came forward with a counter proposal. The two schemes were laid before the Local Government Board, as reported by us at the time; but without waiting for their decision, the Council have come to an agreement to let the Company do the work. Influential local opinion was all along dead-against the Council's proposals; and it is difficult to see why they should have persisted, until the eleventh hour, in endeavouring to frustrate the Water Company's good intentions, only to "throw up "the sponge" at the last. The second authority is the Sevenoaks Urban District Council, who, judging by their action in reference to a proposed purchase of the Water Company's undertaking, must be somewhat at a loss to know how to occupy their time. Ever since October, the Council have been negotiating with the Company, with a view, if possible, to arriving at a mutually satisfactory price for the purchase of the undertaking. As, however, the Company's figure was £146,000, while the Council's highest offer was £86,610, it should have been fairly obvious that an agreement was quite out of the question; and therefore the natural inference was that the Council were prepared to proceed to arbitration, which they are empowered to do under the Company's Provisional Order of 1900. But they appear to have never seriously contemplated such a course; and thus they have been uselessly taking up their own time and that of the Water Company. They dare not face the possibilities of an arbitration; and the Chairman even went so far as to say that it would be "madness" to commit themselves to it. This shows more clearly than anything else could have done that the offer made by the Council was not really a fair one, and that they know it was not a fair one. It is not very usual for parties who may have a good case to fear to place it before an arbitrator; but if the Council are unwilling to give the Company what they know their undertaking is worth, then they are quite right not to place themselves in the hands of an independent person, who would assuredly make them pay that price. Besides the bogey of arbitration, the Council state that there is the probability of an increased, or even entirely fresh, supply of water being required. But this possibility, if it exists, must have been known to them all along, and therefore forms no adequate excuse for the somewhat undignified retreat. In return for all the trouble to which they have been put, the Company have at least some small consolation in the knowledge that the Council have, by their refusal to submit the matter to arbitration, demonstrated to the ratepayers and the consumers, in the clearest manner possible, that the price they offered for the undertaking was a quite inadequate one. The two instances to which we have referred go to prove that at any rate some local authorities have still very hazy notions as to the proper attitude to adopt with regard to the water companies who are doing such excellent work within the districts over which they exercise control.

Devonport Water Bills.

Whatever may be the fate of the Devonport Corporation Bill, there is abundant promise of a big fight over the water supply of the borough before the Parliamentary Committees. Opinion in Devonport is sharply divided as to the wisdom of the Corporation scheme for the purchase of the water-works; and though it has so far survived the perils of the statutory meetings, it is by no means certain that the Bill will pass the greater ordeal of the poll of the ratepayers, which has now to be taken. In either event, the Company's Bill will remain, and of itself promises to afford material for wide discussion. Among its opponents are the Corporation of Plymouth, as well as that of Devonport, and the Devon County Council. Opposed as they are in many ways, the two Corporations are agreed in their antagonism to the Water Company. The three bodies are, in fact, too close neighbours to always agree. In this particular instance, Plymouth sees in the proposals of the Company all sorts of threatened invasion of its ancient water rights and privileges, including trespass on its Dartmoor gathering ground; and it is no more disposed to stand "interference" from the Devonport Water Company than from the Corporation of that town. The Town Clerk of Devonport has explained that his Corporation have no intention of proposing at present the formation of a Joint Water Board for Plymouth and Devonport. What they are looking forward to, it seems, is the day when it will be practicable for the different authorities concerned to consider whether it would be expedient to take joint action with respect to the water supply of the district. It seems to be imagined in Devonport that that day will come when, if ever, Devonport acquires its water undertaking. Judging by the tone of the Plymouth Town Clerk's letter referred to a fortnight since, there is much doubt whether limited partnership on any conditions will be acceptable in Plymouth. Amalgamation or nothing has been Plymouth's policy for years; and though both towns pay pretty dearly for their isolation and independence, there is no evidence that the policy is at all likely to undergo a change in the immediate future.

In the table published on p. 542 of last week's "JOURNAL," giving the "Inclined Retort Installations of Great Britain," the eight arches at Batley were (in error) only credited with a productive capacity of 100,000 cubic feet per day. This, of course, should have been 1,000,000 cubic feet; and the addition will raise the total productive capacity of all the inclined settings of the country to 106,015,000 cubic feet. We thank Mr. J. F. Bromley the Engineer, for calling attention to the matter.

It is pleasant to be able to associate with the gas industry the important national function in which His Majesty King Edward the Seventh and his beloved Queen were engaged in the West of England last week. A conspicuous figure in the ceremonials was Mr. J. A. Bellamy, J.P., the Mayor of Plymouth, who, as our readers may remember, is Chairman of the Gas Company. His Worship was in attendance to receive their Majesties at the North Road Station, and presented them with an address on behalf of the Corporation. His daughter, Miss Jessie Bellamy, had the honour of presenting bouquets to the Queen and Princess Victoria.

It is a matter of common observation that the truth of the aphorism that "change of work is as good as play" is acknowledged by no class of the community more readily than by busy professional men; and among these there is evidently no firmer believer in it than one of the leading men in the industry with which our readers are for the most part associated. As they are aware, Mr. Thomas Newbigging finds relaxation in making excursions into the realms of literature; and he gives the results to his professional friends and the general public in little volumes which it is our pleasure from time to time to briefly notice. His latest effort in this direction is a book of essays which Messrs. J. M. Dent and Co. have just published under the title of "Love's Cradle and other Papers." Strictly speaking, the initial words of the title only apply to the first paper, in which the author takes his readers back to the days of the troubadours, when, as he says, "Love was King, and his decrees were accepted with unquestioning obedience." Mr. Newbigging next puts in a word for the "waits," who are often confounded with "Christmas singers," from whom, however, as he shows, they are perfectly distinct. He then discourses upon "Chivalry," pointing out how its exaggeration brought it into ridicule, and goes on to criticize the religious value of "Mystery and Miracle Plays." In the next essay, he deals shortly with "Gladiators and the Gladiatorial Spirit;" and the concluding one bears the title of "*Fuimus Redivivus*." In this he shows how, by the help of the imagination, "the pleasanter incidents of youthful days are a perennial source of grateful remembrance." Our author says they "are;" and we hope the tense he employs is generally applicable. But we live now, as he admits, in a "faster and less leisured age," and men become jaded in their endeavours to keep up with the pace of the times. In such circumstances, as Mr. Newbigging points out, "to have no pleasant memories to fall back upon is as desolate a condition for the mind as can well be imagined." To such memories the Poet of Nature, as our author will remember, owed "'mid the din of towns and cities . . . in hours of weariness, sensations sweet;" and we sincerely pity the man who finds himself compelled to confess, with the Preacher of old, "I have no pleasure in them." Mr. Newbigging is to be congratulated on having produced a very readable book in every sense of the word.

ESSAYS AND REVIEWS.

THE OUTPUT OF COAL AND THE PRESENT SITUATION.

WRITING exactly twelve months ago, when the coal output figures for 1900 were published, and the question of future coal contracts was being considered seriously, we expressed the opinion that, while it was not only possible, but probable, that the output in 1901 would not equal that in the preceding year, owing to slacker working on the part of the miners, yet, even were the 1901 output to fall back to the 1899 figure, there would still be plenty of coal to go round. This opinion was based upon the probability of a lessened home consumption, and of a reduced export, and also on the existence of ample stocks at the beginning of the year. It has been fully justified by the event. There was no scarcity, while at the same time there was no serious glut, of coal in the market throughout last year, notwithstanding the fact, now officially announced, that the output was as much as 6,000,000 tons less than in 1900, and 1,000,000 tons less than in 1899.

The actual figures for the past four years (in thousands of tons, excluding the small output from quarries) are: 1898 (strike in South Wales), 202,045; 1899, 220,085; 1900, 225,170; and 1901, 219,037. Deducting the tonnage of coal sent out of the country, we get the following figures as the quantities remaining for home consumption (in thousands of tons): 1898, 154,788; 1899, 164,757; 1900, 167,331; and 1901, 161,694. There was, therefore, a reduction in the quantity of coal put on the home market last year of 5,637,000 tons compared with the previous year, and of 3,063,000 tons compared with 1899. The falling off in the demand on our manufacturers of iron and steel, due to decreased exports, and increased imports last year, represented a reduction in their coal requirements of about 3,000,000 tons, comparing 1901 with either of the two preceding years. So there was just about as much coal available for use in the production of home requirements of iron and steel goods, and for use in the other home industries, last year as in 1899, and 2½ million tons less than in 1900. These facts, coupled with the reductions in the price of coal that have taken place, in spite of the diminished supply, provide striking evidence of the general slowing-down of trade in the country.

This very material drop in the total output of coal is a somewhat serious matter, being decidedly greater than was expected, even by those who knew how widespread was the disposition to idle on the part of the miners. We certainly did not anticipate a year ago that the output in 1901 would fall below the 1899 figure, while quite prepared for a considerable reduction. But it proves to have been a full million tons less. Now, a million tons (though little more than ½ per cent. of the total home consumption) added to or withdrawn from the market supply, have a material effect upon the condition of that market; and the withdrawal of six millions since 1900 fully accounts for the fact that the price of coal has not fallen below its present level. The explanation of the reduced output is not far to seek—bei g afforded by a consideration of the average amount of coal sent to bank by each man employed below ground. The figures are as follows (being tons per man): 1898, 363; 1899, 385; 1900, 367; and 1901, 344. The full significance of these figures will be seen when it is remarked that, had the individual output last year been either (1) equal to that in 1900 or (2) equal to that in 1899, the aggregate would have been (1) 233,800,000 tons or (2) 245,300,000 tons, instead of only 219,037,000 tons.

Looking at the year's statistics, county by county, we find that the output in Durham was, roughly, 900,000 tons less than in any of the three preceding years, during which it was very regular—not varying more than 130,000 tons on a total of between 34 and 35 millions. Northumberland's output was 243,000 tons less than in 1900, but 88,000 tons more than in 1899. Yorkshire, which jumped up from 25·6 millions in 1898 and 26·9 millions in 1899 to 28·2 millions in 1900, fell back in 1901 to 27 millions; while Lancashire, like Durham, sent to bank much less than the average of the three previous (very regular) years—the figures being 23·7 millions in 1901, against an average of 24·5 millions. Staffordshire shows the biggest proportionate reduction—only producing 13·1 millions last year, against 14·2 in 1900, and an average of 13·9 millions in the three years 1898-1900. The totals for England (in millions) read: 1898, 147·8; 1899, 155·9; 1900, 159·3; and 1901, 153·5. Wales, curiously enough, bearing in mind the famous "stop days," alone shows an increase over 1900, though the total is slightly below the 1899 figure: 1899, 33; 1900, 32·6; and 1901, 32·7. Scotland last year practically maintained the 1900 level, with 32·8, against 33·1 millions; the output being much above 1898 (30·2) and 1899 (31·1). The chief delinquents, therefore, are the English miners, especially Durham men and those in the Federation districts.

No better working is, unfortunately, to be looked for, at present, from the Federation men, their wages being still at the maximum of 60 per cent. above the standard, and their object in keeping down the output is, of course, to maintain them at that maximum as long as possible by keeping up the price of coal. We shall not get back to a normal production per miner until the wage-rate in England is reduced to a normal figure. Meanwhile, the exports of coal, both for delivery to foreign countries and for the use of steamers engaged in foreign trade, remain at a remarkably high level. During the first few months of 1901, they fell away very considerably; the reduced shipments materially assisting in bringing down the price for the Spring contracts. But this year the exports so far have been at the higher rate prevailing in 1900. The figures for the month of February, compared with the same month in the two preceding years, read: 1900, 4,231,453 tons; 1901, 3,694,500 tons; and 1902, 4,123,469 tons. For the two months, the 1902 shipments exceed 1900 by 268,000 tons, and 1901 by 569,000 tons. The exports of iron and steel remain practically at the same level as during the same period of last year, which was, of course, far below that of 1900. If the extraordinary situation in the United States, where an output of pig iron equal to an annual production of 18 million tons is at present insufficient to meet the demand, should continue for any length of time, our exports of iron and steel may increase somewhat, though Germany and Belgium would be keen competitors with us for any orders from across the Atlantic, and Canada is more likely than this country to benefit by the shortage in the States.

With a curtailed output of coal at home, a general strike of miners threatened in France, and the possibility of an increased export of iron and steel, the situation is not for the moment so entirely favourable to coal buyers as they would wish, seeing that prices are still considerably above the normal. But inasmuch as none of the adverse factors we have named are of a permanent character, there is no cause whatever for anxiety as to the future, nor the slightest occasion for buyers to commit themselves to long-term contracts, except upon conditions reasonably satisfactory to themselves.

ELECTRIC FURNACES: PRESENT AND FUTURE.

AN interesting paper, on "Electric Furnaces," was read on the 4th inst., at the Owens College, Manchester, before the local section of the Institution of Electrical Engineers. The author, Mr. Bertram Blount, Assoc.Inst.C.E., F.I.C., has the happy gift of being able to invest a highly specialized branch of technical science with many points of general interest, and thus even so apparently remote a subject for the attention of the gas engineer as electric furnaces becomes, in his hands, highly suggestive and instructive to gas men, as well as to those more directly concerned with it. For this reason, we propose to refer to some of the more striking features of his contribution to technical literature.

The author plunges at once into his subject with a definition which sets one analyzing one's preconceived ideas of an electric furnace—*i.e.*, "the function of an electric furnace is to produce a temperature of a degree, or in a place, unattainable by other means." The stickler for grammatical precision may wince ever so little; but the statement is terse, and its meaning plain. Substances which need for their formation a temperature higher than 2000° C. can be prepared only by the use of the electric furnace; while in certain places, as, for instance, the interior of the ubiquitous glow lamp, a carbon filament or other body is inaccessible to other than electrical methods of heating. Evidently this definition of the functions of electric furnaces is very comprehensive. But why are temperatures higher than 2000° C. to be the exclusive preserve of the electric furnace? Because, says Mr. Blount, that limit is about the point of the dissociation of all compounds of carbon and hydrogen with oxygen. "If it were possible to cause oxidation of these fuels to proceed irrespective of temperature, greatly higher values would be obtained." Thus the combustion of carbon should give the astoundingly high temperature of 10,178° C. = 18,352° Fahr. But, "unfortunately, we cannot separate the products of combustion from the heat which they produce in such a way as to remove the products and leave the heat behind as an entity distinct from matter. Thus it comes about that these products of combustion reach their dissociating temperature far below that calculated from their heat of combination and the specific heat of the product, and however we may urge our furnace, our maximum is fixed."

Now industrial non-electrical furnaces at their best give a temperature not greatly exceeding the melting point of platinum, which is 1775° C., or 3227° Fahr. Probably the highest temperature attainable from fuel is about 2000° C., or (say) 3650° Fahr.—Mr. Blount thinks that this highest temperature could be reached most certainly by burning retort carbon in oxygen in a furnace fed with a blast of the gas and well jacketed. Quartz can be volatilized in an air-fed furnace of this nature. For higher temperatures than 2000° C., however, the combustion of fuel must give place to the electric furnace, which also has the advantage for some industrial operations for which so high a temperature is not required. Mr. Blount appears to have neglected to discuss the relative merits of the electric furnace and the thermite reaction as a means of accomplishing a number of technical operations for which ordinary fuel heating is clearly inferior. A temperature of 3000° C., or (say) 5450° Fahr., is reached when the thermite reaction is properly conducted; consequently it can compete with the electric furnace in operations for which ordinary combustion furnaces are useless. We have heard a good deal of late as to the superiority of thermite to electricity for the welding of rails, &c., *in situ*, and Mr. Blount's opinion on the point would have been welcome.

We were glad to find Mr. Blount doing full justice to M. Moissan's disinterested work on and with the electric furnace. It has

often been pointed out in the columns of the "JOURNAL" that certain persons had sought to monopolize the methods which Moissan had given to the world at large. One notable instance is the application of the electric furnace to the production of calcium carbide. Let us quote Mr. Blount on this question:

It is of considerable interest to manufacturers, more particularly those who have at their disposal large quantities of waste power from blast-furnace gases, or the gases from recovery coke-ovens, that a few weeks ago a decision was given in the Law Courts by which the manufacture of calcium carbide in the electric furnace has been declared public property in this country. Of course, it is possible that an appeal may be entered against this decision; but I for one do not regard it as likely to succeed. As the matter stands at present, it has been held by Mr. Justice Buckley, in an exhaustive judgment, that the Willson patent for the manufacture of calcium carbide is invalid for want of novelty. Those who have studied the question are aware that Moissan's discovery of the method of preparing calcium carbide in an electric furnace was published some time prior to the date of the patent; and this publication was so full and explicit that everything necessary for the industrial preparation of calcium carbide in the electric furnace was thereby disclosed. No doubt there will still be rights in particular forms of apparatus; but the broad fact that calcium carbide can be manufactured by heating lime and carbon together in an electric furnace has been publicly set forth, and is open to everyone to utilize.

The case referred to has, of course, already been reported in our columns (*ante*, p. 354), and independent writers on acetylene and carbide had long since stated their belief in the priority and sufficiency of M. Moissan's work—*e.g.*, Mr. W. J. A. Butterfield in the chapter on "Acetylene" in his book on "Gas Manufacture," pp. 356 to 359. But it is well that the importance of the recent decision to potential manufacturers of calcium carbide in this country should be emphasized in communications such as that of Mr. Blount's, from which the above quotation is made.

Mr. Blount especially censures Sheffield for its neglect of the electric furnace. He refers to a paper by Siemens some twenty years ago, in which that far-seeing technician showed that a properly-designed electric furnace, though necessarily falling behind a good regenerative gas-furnace in economy of fuel, is more economical than furnaces of the type used in Sheffield for the manufacture of tool steel, and fed with solid fuel on a hearth. Though the more extended use of gaseous fuel—to which extension the Siemens family have contributed not a little—has somewhat altered conditions, yet the efficiency of the electric furnace has been improved since Siemens wrote, and Mr. Blount, in his summary of the applications—either existent or probable—of this furnace, speaks of its use for the preparation of substances "which may be prepared by other methods, but are difficult to manufacture economically by any external method of heating. Such are zinc, phosphorus, and carbon disulphide. I would add steel, for to heat this most delicate material in contact with ordinary fuel and its products of combustion is to invite disaster. Siemens realized this clearly enough; and if our friends at Sheffield were a little less tied by tradition, his ideas would have been in successful operation twenty years ago."

Evidently the economy of the electric furnace in competition with gaseous fuel rests on the facility with which it may be applied to internal heating. Some one once suggested that in the future coal would be gasified on a large scale by the application of electric heating to the *interior* of the charge, instead of by the application of fuel heating to the *exterior* through the walls of retorts, as at present. This was the dream of an electricity enthusiast; but it is well that gas engineers should recognize the great scope of the electric furnace. It has been fairly, attractively, and successfully set forth by Mr. Blount in the paper which he read last week.

ELECTRIC LIGHTING MEMORANDA.

Deadly Electric Currents in the House—A Sheffield Fatality—Further Information Required—The Nernst Lamp of 1902.

ELECTRICITY has always merited the designation applied to Ariel, of being a "tricksy spirit." Those who observed the beginnings of the introduction of commercial electric lighting into this country are not likely to forget the numerous disconcerting incidents that attended the first displays of incandescent lighting at the Crystal Palace and elsewhere, when banquets of enthusiastic electricians begun under the new lamps had often to be concluded in the gloom of candlelight. Similarly, only the other day, the Arbitrators appointed to decide upon the system to be used for the electrization of the Metropolitan Railways had no sooner recommended the one employed on the Central London Railway, partly for the sake of its safety, than a passenger was killed on the line under conditions of harrowing poignance. And now, Mr. A. P. Trotter, the generally trusted Electrical Adviser of the Board of Trade, having read a paper before the Institution of Electrical Engineers in the course of which he triumphantly demonstrated the harmlessness of the normal traction current of 500 volts, a man, described as an electrician's labourer, named William Richard Hird, promptly killed himself in the Alhambra Theatre, Sheffield, by "monkeying" with a disused electric light bracket. There is no getting over the awkwardness of this untoward incident. The man is dead; and a coroner's jury has said that he died by accident, which is doubtless true. But it is not to be wondered at that the electrical journals should regard, as they do, the whole affair as profoundly unsatisfactory, and needing further investigation.

For, see what it implies. Here is Mr. Trotter performing all sorts of tricks upon a model Central London Railway connection. He has stood upon the rails with wetted boots, sat upon the live conductor, slapped the running rails with his bare hands, seized hold of the trolley wire from the top of a tramcar; and not only lives to tell the tale, but offers to do the same again, at any time. Yet a man who "for a lark," plays for a moment with an ordinary electric lighting bracket such as anybody might touch, is killed by the indoor lighting current of 200 volts. The "Electrician" opines that the incident will specially interest Mr. Trotter and the other members of the Institution of Electrical Engineers. It certainly ought to do so. The narrative of the event given before the Coroner by the deceased's companion (himself described as an electrician) is striking in its simplicity. The men went into a gas-lit lavatory at the theatre, when one took hold of the electric light fitting in question. and immediately called out "Push me away, it's killing me!" He was in a "drawn up" condition, his feet being about a foot above the floor. The other man pulled him down, receiving current himself. The victim never spoke again, and only lived about 10 minutes, although his comrade tried artificial respiration on him, and appears to have acted correctly in the circumstances. Of course, the Coroner's Jury took the severely legal view of the man's fate, under the direction of that intelligent official, who told them that the young man had "brought the shock on himself by doing what he had no right to do." That is true; but it is surprising that it was not accompanied by a further explanation of the law. There is a general impression about, happily, that a man has no justification for strewing man traps and spring guns about his own premises for the maiming of trespassers. One would imagine that the same principle applies to persons who introduce deadly electric currents into places of public resort.

It is surely not an offence rightly punishable with death that this man Hird committed. Nor should it have been possible for such a consequence to flow from his act, Our electrical contemporary reports that Mr. Dickinson, the Chief Electrical Engineer at Leeds, attributes the death to the existence of "a special set of circumstances." That is as may be. It is the more to be regretted that the Sheffield City Coroner took such a cursory view of his duty in these circumstances as led him to terminate his inquiry without going into them. The "Electrician" hopes that the Board of Trade will take the matter up. So do we. It is an eminently suitable problem for Mr. Trotter to tackle. The sugestion is offered that a high-pressure shock, through a defective transformer, may have got at the man on this occasion. There should be no room for any doubt as to what really happened. If the matter is not properly cleared up, there will be not a little reluctance on the part of the public to have anything to do with these mysterious currents. It is distinctly not enough to write them down as due to exceptional circumstances. It is the exceptional circumstance against which the public need most protection. The ordinary risks of life we can and must take; and they are not a diminishing quantity in modern civilised existence. But these unsuspected, unavoidable perils are not to be laid upon us in the light-hearted way that a few electricians seem to think appropriate in this connection.

Once more the Nernst electric incandescent lamp has put in an appearance among us. It is reported that the German makers of this hitherto elusive appliance have gone the length of listing the lamp in various sizes, and in parts, and have actually sent over some lamps. One has reached the "Electrician," which vouches for the fact that it is a real 200 volt, half-ampere, continuous current article, and will burn on an ordinary lighting current. The lamp has the general appearance of a miniature arc lamp; the spherical bulb containing the lighting element being surmounted by a long "box of tricks" which holds the self-acting resistance and so forth. The latter is a permanent part of the fitting; while the glass and its burner are removable. There is an automatic lighting attachment to the illuminating member, which makes the latter hot enough to pass the current and then becomes disconnected. Also, in order to protect the filament, as it is conventionally called—it is not strictly speaking a filament at all, but a rod—these lamps must have resistance in series with the filament performing a similar function to the steadying resistance of an arc lamp. Thus the whole thing is analogous to an arc lamp. It costs in the first instance £1, renewal burners being 2s. each, resistances 1s., glass globes 1s. clear and 1s. 6d. frosted. Figures relating to the performance of the lamps will be received with interest.

A CHAPTER OF THE HISTORY OF SHEFFIELD TRADE-UNIONISM.

IT is one of the perpetual surprises of life to discover the secular and the general in what, to individual experience, appears to be something exceptional and peculiar. We all learn from copy-book headings and other stores of the wisdom of the Ages, that "there is nothing new under the sun," and are saturated with similar warnings of the deceptiveness of apparent novelties. But the probability is that, when we might remember these aphorisms for our comfort, we never think of them as applying to the particular case. Thus, the employer of labour faced for the

first time in his life with a strike of his workpeople, is always astonished at the circumstance. He thinks that his workmen, at any rate, cannot have anything to complain of; and he wonders that they should be such fools as to throw up their good employment at the instigation of an agitator, the nature of whose interest in fomenting industrial strife is patent to everybody except his dupes. Time and again, as strikes come to their duly appointed end, and ugly stories get into the newspapers as to the misappropriation of the strike funds, people shake their heads and opine that "that sort of thing will open the eyes of the men" to the real character of the part they have been induced to play. But it never does. Strikes are local and temporary; the underlying cause of them is general and persistent.

This reflection is suggested by the recent notices that appeared in all the newspapers and some technical journals of the most noteworthy passage of the career of the late Sir William Christopher Leng, who, at a grave epoch in the industrial history of Sheffield, when the trade of the town lay bound fast in the bonds of that phase of Trade Unionism of which the infamous Broadhead was the chief exponent, undertook, in his capacity of Editor of the "Sheffield Daily Telegraph," to deliver the community, and succeeded. Then, as now, it was not the "principle" of Trade Unionism to which objection could be taken; it was the particular method of its operation which constituted a public danger, and called for suppression. As the "Engineer" puts it: "For years the city had been given over to secret rattening, and to trade outrages which had practically superseded the law of the land." It is the latter character which has not ceased to cling to the operative methods of that Trade Unionism which remains to this day. Militant Trade Unionism has never been able to keep within the wide boundaries of the law, nor to conform to the dictates of that eternal justice which in the last resort rules the relations of man to man. In this spirit of revolt, it shares the distinguishing nature of all secret, selfish, class, and separatist organizations. For it is the general truth that no class organization can pursue its own selfish and exclusive ends without trespassing upon common rights.

Broadheadism, which Sir W. C. Leng crushed, was merely one form of this kind of action. Its very violence and crudity would certainly have brought it to grief sooner or later, even though the Royal Commission evoked by the efforts of Leng and the Chief Constable of Sheffield had not exposed the enormities perpetrated in the supposed interest of the Society saw-grinders. This observation does not detract from the merit of those who saved Sheffield in 1867, but is only intended to be taken as a warning against the entertainment of the facile delusion that the relief of a symptom is tantamount to the curing of the disease. When men are starved or driven to suicide by the secret pressure of Trade Union tyranny, it is as much murder as anything that was ever traced to William Broadhead. And in a minor way, the slow perishing of a trade wilfully caused by the undue restriction of apprentices, and the practice of organized idleness, which are the avowed councils of Trade Unionists to-day, are as deadly offences against the body politic as rattening and the mutilation of men. The differences between all these acts are only of method. They barely amount to differences of degree; because starving a man, or an industry, is no improvement upon the use of dynamite for the purpose of destruction.

By a coincidence, there died almost simultaneously with Sir W. C. Leng another worthy of the same parts, whose name is to be kept in remembrance for a bold, self-sacrificing, and righteous deed which somehow was not mentioned in the obituary notices that went the round of the papers. This was Earl Fitzwilliam, known in industry as a large colliery owner. We believe we are correct in stating that back in the year 1873, when coal was not so much coal as gold to the possessor, Earl Fitzwilliam was confronted with a demand from the men working one of his pits for the dismissal by his agent of a particular man, who for some reason was obnoxious to the Union. If we remember the story rightly, the Earl personally investigated the matter, and decided that the man objected to was not in the wrong. But this trivial circumstance did not weigh with the Union, who declared that, unless the man was sent away, their members would stop raising the Earl's coal. His Lordship's reply was what might have been expected of one whose nobility was not wholly of Royal creation. He shut up the pits, and kept the keys in his pocket until the misguided colliers, some months after, came and owned their wrong. Then his Lordship "improved the occasion" by telling them that it was only the accident of his being able to afford the luxury which had enabled him to show even-handed justice to a poor man who had done nothing to forfeit his rights, which were neither less nor more than their own.

Lord Penrhyn is the leading contemporary example of the same power and will to resist the evil of popular tyranny. The lesson here for all employers is that, whether in small things or in great, there must be no compounding of civil wrong with the forces of sectional interest. The Trade Unions have not yet stopped lamenting over the Taff Vale and Belfast judgments, which simply showed that, like everybody else, they are amenable to the law of responsibility for their action. If these organizations never meant mischief, they would not need to complain of the supremacy of the civil law. That they do so complain, exhibits their true colours; and it also shows that the cause for which Sir W. C. Leng and Earl Fitzwilliam, in their age and respective degrees, stood forth against great odds is still in need of as brave defenders.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 659.)

For the greater part of last week, business on the Stock Exchange was in a very dull condition. The tendency to keep quiet, and take breath, after a period of much excitement and activity was partly the cause of this; the closing of the Exchange on Saturday helped; and already we are beginning to feel the approach of Easter. However, the dullness wore off to some extent before the end of the week, and in some departments—the Funds for instance—prices had an advance. The Money Market was very steady. There was a good demand all through the week for accommodation; but discount rates rather showed a disposition to be easier. In the Gas Market, there was really a fair improvement in the volume of business, once more showing how apt this matter is to take a line of its own, unswayed by what may rule in other departments. And the tendency, although not strongly marked, was in favour of higher prices. Actual changes in quotation were few and slight; but all were in the upward direction. The small proportions to which business has for some time past been limited would seem to be for the most part owing to a scarcity of stock in the market. That there is a good demand on the part of the public for Gas stocks of high character is proved by the fact that week after week many tens of thousands of pounds of stock are readily disposed of at the Mart, and that the prices obtained there are not infrequently better than those quoted on the Exchange. In Gaslight issues, the ordinary was fairly brisk all through the week. It opened rather better, but fell back on Tuesday to 90½. Then it took another start, and marked 92½; but the final bargain was at only 91. The quotation, however, was 1 up. Only moderate business was done in the secured issues, at about middle figures. South Metropolitan was rather quiet, and not inclined to move. In Commercials only one bargain was marked. There was a shade more activity in the Suburban and Provincial group, with dealings in Brentford, Crystal Palace, and Tottenham. The "B" stock of the latter is quoted 93-98; but in the Mart £10,000 of the stock fetched over 100. The Continental Companies were quiet; and the only change was a rise of a point in Imperial debenture. Movements in the undertakings located in the remoter world were limited to a fractional rise in River Plate. The Water Companies are still in a state of indecision over the Government Bill. Chelsea went down some points, and then went up again; while the rest did nothing at all, except East London, which rose in view of the announcement that a 1 per cent. better rate of dividend will be recommended at the forthcoming meeting.

The daily operations were: Gas opened steady on Monday, and remained unchanged. In Water, Chelsea fell 5. A little more activity in Gas was perceptible on Tuesday. Imperial debenture rose 1, and River Plate ¼. Wednesday's transactions were about on the same level. Gaslight ordinary rose 1. In Water, Chelsea recovered 5. Thursday brought no change in Gas; quotations remaining unaltered. Friday was as active as any day in the week; but no further alteration took place in Gas prices. In Water, East London rose 5. The Stock Exchange was closed on Saturday.

OBITUARY.

Bryan Donkin.

We greatly regret to record the sudden death, from heart failure, at Brussels, on the 4th inst., of Mr. Bryan Donkin, M.Inst.C.E., M.Inst.M.E. The deceased gentleman was in the Belgian capital fulfilling a business engagement, and was fully occupied on Monday. On returning to the Grand Hotel, where he was staying, he complained to a waiter of feeling unwell, and asked him to send for a doctor. Mr. Donkin went to his room; but before medical assistance arrived he had passed away. We learn from "Engineering," to which we are indebted for the following particulars of Mr. Donkin's work, that he had previously complained of heart trouble, for which he recently consulted his cousin, Dr. Horatio Bryan Donkin, who, while counselling some diminution in his patient's characteristic ardour, did not think the case one for advising complete cessation of work.

Mr. Donkin was born in 1835, and was consequently in his sixty-seventh year. He was the eldest son of a well-known engineer, Mr. John Donkin, and the grandson of a still more brilliant scientist—Mr. Bryan Donkin, who in the year 1803 founded the well-known works in Bermondsey. He was educated at the University College and at the Ecole Centrale des Arts et Métiers in Paris, and served an apprenticeship under his uncle at the above-named works. He became a partner in 1868; and when, the following year, the firm was converted into a limited liability company, he was made Chairman, and continued to hold this position after its amalgamation with Messrs. Clench and Co., of Chesterfield, in 1900. He then, however, relinquished active participation in the management of the business. In the early seventies, Mr. Donkin turned his attention to the scientific side of engine design; and his investigations in connection therewith led to many improvements being effected in details. One department in which he did specially valuable service had reference to steam condensation in cylinders, and its reduction by jacketing and

superheating, as well as to the investigation of the laws governing the transmission of heat through cylinder walls. By a somewhat remarkable coincidence, we give in another part of the "JOURNAL" a summarized translation by him of an article bearing upon this subject by Herr E. Körting, the proofs of which he corrected a few weeks ago, and of which pressure on our space has hitherto prevented the publication.

Early in the nineties, Mr. Donkin directed his attention to the subject of internal-combustion motors, and found in them also a subject congenial to his inquiring disposition and facile pen. In 1894, he read a paper before the Institution of Gas Engineers on "The Comparative Merits of Steam and Gas Motors;" and in the same year he prepared for the Manchester Association of Engineers a review of the scientific work of Hirn, which is as lucid as it is instructive and sympathetic. A year later, Messrs. Griffin published the first edition of his standard work on "The Gas-Engine," now in its third edition. He also published, through this firm, a book on the steam-boiler, with details as to the heat value of fuel, analyses of gases, evaporation, &c.; and he translated Diesel's work on "The Theory and Construction of the Rational Heat Motor." At the same time, he was himself engaged in original research work in connection with internal-combustion engines; and he was a judge for the Royal Agricultural Society and at other competitions. He introduced at his works the Perret system of forced draught, the manufacture of which apparatus was taken up by the firm and successfully developed.

There are few volumes of the "Transactions" of the leading technical institutions without some contribution from Mr. Donkin, for he was as willing as he was able, from his extensive practice, to add to the profit derivable from any discussion. As far as the "JOURNAL" is concerned, the name of Donkin has been associated with it, in connection with the firm of which the deceased gentlemen was till recently the head, for more than half-a-century; while he himself was a valued contributor to its columns. Within the past few years, communications by him have appeared on "The Number, Use, and Application of Gas-Engines," and "The Life-Work of Edouard Delamare-Deboutteville," as well as articles not bearing his name, one of which has been already mentioned.

Mr. Donkin was a Vice-President of the Institution of Mechanical Engineers, a Watt Medallist and Telford and Manby premium and prizeman of the Institution of Civil Engineers, a member of the Royal Institution, of the Société Industrielle de Mulhouse, of the Verein Deutscher Ingénieure, and of the American Society of Mechanical Engineers. He was a Director of the Crystal Palace District Gas Company, having been elected last August to fill the vacancy on the Board caused by the death of Mr. Frederic Lane Linging; and our readers may possibly remember that at the last meeting of the Company, on the 14th ult., the new Director, in acknowledging his re-election, made a few interesting remarks on the subject of power gas and gas-engines, in which direction he thought that there was a considerable future for gas companies.

The funeral took place at Bromley Cemetery last Saturday, in the presence of many sorrowing friends; for, alike for his great ability and for his geniality, he was widely beloved, and his loss will be much regretted.

Worcester has lost one of her most distinguished and public-spirited citizens by the death of Mr. JOHN STALLARD, which took place recently in his eightieth year. Deceased was a solicitor by profession, and among other appointments held by him was that of legal adviser to the Worcester New Gas Company, of which he was Chairman till the time of his death.

PERSONAL.

Mr. W. FORD has resigned the office of Manager of the Stockton-on-Tees Electrical Department, in order that his time may be devoted exclusively to the increasing responsibilities of the gas-works.

Mr. A. L. HOLTON has been appointed Chemist and Superintendent of the sulphate of ammonia and sulphuric acid works at the Bradford Road station of the Manchester Corporation Gas Department.

Mr. ALBERT F. YOUNG, Manager of the Harrington Gas-Works, has just been chosen, out of 43 applicants, as the successor of Mr. Harold Baker as Gas Manager to the Cockermouth Urban District Council.

At the meeting of the Institution of Civil Engineers last Tuesday, it was reported that Mr. H. H. JONES, Engineer and Manager of the Wandsworth and Putney Gas Company, had been transferred from the rank of associate to that of member.

Mr. GEORGE HELPS, the Secretary of the Bath Gas Company, has tendered his resignation, after a period of 48 years' connection with the undertaking. The Directors, in consideration of his long and very valuable services, have unanimously agreed to allow him a retiring pension.

A meeting of the Lostwithiel Gas Company was held recently, for the purpose of selecting a Manager in the place of Mr. F. C. Bartlett, who has resigned. There were several applications for the position; and Mr. W. HODGE, the Manager of the Callington Gas-Works, received the appointment.

NOTES.

The Adulteration of Red Lead.

M. Pellet, a French analytical chemist, has published his views of the commercial adulteration of red lead, which he believes to consist mainly in the addition of barium sulphate to pure oxide. The reason is that barium sulphate is the only substance heavy enough to go with the red lead. As it is of white colour, it is usually stained to avoid detection on this account. M. Pellet has found one specimen of commercial red lead which contained 55 per cent., and another 71 per cent. of the barium sulphate adulteration; while in one case there was no lead at all in the sample. The adulterated commodity does not possess any of the peculiar properties of red lead. It has little covering power, and does not set hard. Adulterated red lead may be detected fairly well by mere inspection. A glass bottle containing pure red lead should be kept for use as a colour standard. Next, a flask of red lead should be weighed against a similar flask of the suspected article, which will be lighter if adulterated. Pure red lead passes with difficulty through a sieve; while barium sulphate sifts through easily. The dye of barium sulphate can be washed off with water. Red lead dissolves completely in a sufficiency of sugared water, acidulated with nitric acid. Barium sulphate remains unaltered by such a solution. Users of red lead ought always to purchase it under a guarantee of purity. There is no difficulty in getting it 98 per cent. pure; and any addition greatly deteriorates it.

Huygens and the Undulatory Theory of Light.

A noteworthy example of the slowness with which some true theories take possession of the intellectual world, and also of the hindrance to the spread of truth due to the acceptance of false theories, is to be seen in the record of the only two theories of light which have ever attracted much attention. Huygens, whose "Life" has lately been published, issued his "Traité de la Lumière" in 1690. It had been written in Paris twelve years earlier. Leibnitz wrote to the author to express his surprise at, and satisfaction with, the undulatory theory of light therein first expounded; adding that when he saw how well it accounted for double refraction, he passed from esteem to admiration. Papin also wrote to express his general approval; but otherwise there are very few allusions in Huygens' correspondence to his wonderful theory, which had to lie dormant for more than half-a-century before it ever began to be seriously examined and to gain adherents. But all these matters were at the period in an inchoate state. It is otherwise curious to us that Newton should have rejected the undulatory theory of light, while Huygens refused to accept the theory of universal gravitation. Both of these theories lie at the base of modern natural philosophy; but while the objections of Huygens did not retard the progress of the theory of gravitation, Newton's rival theory of light is certainly chargeable with the long neglect of the truer theory set forth by his Dutch contemporary. Thus one sees again that the greatest among philosophers is not equally well inspired all round.

The Oil Gas of Indiana Failing.

It is reported by the State Geologist of Indiana that the native supply of natural gas, at the actual observed rate of exhaustion of the wells, will not last longer than another five years. Ever since the first application of this natural product to industrial and domestic heating purposes, the waste has far exceeded the used proportion. Not only is the gas wasted in unsuitable furnaces, grates, and stoves, but it has been permitted to escape into the air at the rate of perhaps 20 million cubic feet daily, through neglect to cap the wells which have been bored for oil. Originally, the gas-producing territory covered an area of some 3000 square miles, whereas to-day it has shrunk to one-half of this superficies. At first, the gas issued from the wells at an average pressure of 325 lbs. per square inch. Now the pressure does not exceed 200 lbs. anywhere. During the past year, the gas pressure in the middle of the Indiana field fell 30 lbs. per square inch. This is the datum on which the State Geologist bases his computation of the probable duration of the gas supply. The local manufacturers who are at present using the gas for fuel, are quite indifferent to the prospect of its exhaustion, knowing that after it has failed, they can get cheap oil fuel from the same source. The same wastefulness of what should be regarded as a valuable gift of Nature has characterized the people of the neighbouring States of Pennsylvania and Ohio. The truth of the matter seems to be that the natural gas was not particularly wanted, and therefore will not be greatly missed.

Iron Paints for Air and Water Must be Different.

M. Andés recently carried out a series of tests of preservative paints, including samples of many of the best known kinds of oil paints, varnishes, and boiled oils. The scheme of these tests was much more extensive than is usual in such experiments, and included exposures of painted iron to the weather, to water, to 3 per cent. of sodium chloride solution, and to hydrochloric acid and copper sulphate solutions. The iron sheets were sometimes given one coat only, sometimes two or more, or different priming coats were employed. In the air tests, the plates were exposed in a horizontal position, side by side, to sun and rain for a period of

six months. At the end of this time, they were rinsed in water, cleaned with soap and brush, and the films examined. All sorts of mixtures were tried on the 76 specimens tested; and the general conclusions drawn were as follows: Neither raw linseed oil, boiled oil, wood oil, nor a coloured spirit varnish consisting principally of dammar, will prevent iron from rusting in air. The series of tests in water was made by immersing either iron plates or else sheets of glass painted, in bottles of water kept at the ordinary room temperature. With the solitary exception of red lead, none of the paints could be depended upon to keep the iron from rusting. It follows that, for the preservation of iron under water, oil paints are utterly useless. The only permanent coating for iron under water is a spirit varnish—that is, a resin dissolved in a volatile solvent; and this is one of the very same preparations which are valueless as protection against the weather. Hence, coatings for preserving iron and steel in air and in water must be totally different. A spirit varnish composed of resin and celluloid makes an excellent preservative for iron.

An Analysis of Texas Oil.

We have received from a gentleman interested in American oils a copy of the results of a test of crude Texas oil made by Mr. Robert Steiner, of the Union Oil Refining Company, of Beaumont. The analysis does not give exactly the information required by makers of carburetted water gas; but still it may interest some readers. It is as follows:—

	Per Cent.
Water	1
Naphtha, benzine, and gasoline	3
Kerosene	10
Signal oil	10
Lubricating and cylinder oil	48
Gas oil	15
Asphaltum residuum	12
Waste	1

Reinforced Concrete Pipes and Coke Pockets.

Professor Jacques Bryer has contributed to the "Engineering Magazine" some descriptive articles on "Reinforced Concrete Constructions," with special reference to the Cottancin, Bonna, and Hennebique systems, all of which appear to be much used in France. A good deal of structural work which in England would be carried out in plate or cast iron is done on the Continent in this material—especially large water, gas, and sewage pipes. The advantage is that, where the pressures are not high, a distribution system of great capacity can be provided in this way at a very low cost. There is the drawback that at first pipes of this kind are not tight but porous, and will lose from 13 to 33 per cent. of their contents until the material becomes carbonated, which fills up the pores. An ordinary Bonna pipe consists of a number of longitudinal bars wound round with a spiral bar, and the whole embedded in the concrete. Pipes 8 or 10 feet in diameter are readily made in this way. Where initial tightness is required, the pipe is, in addition, lined with a light riveted sheet-steel inner skin. This lining need only be thin, oxidation being quite obviated by the concrete covering. Or the lining may be of lead-lined sheet iron, as in the Chameroy make of gas-main so largely used by the short-term concessionary gas companies of the Continent. The joints are simply butted, with a sleeve. The attachment of branch pipes and services is then effected by means of a clip which goes round the main. The concrete at the connection is chipped away, the lining cut through, and a cast-iron saddle-piece is screwed upon it by nuts on each side, working on the screwed ends of the clip. The joint is made with a leather washer. Much work in connection with the extension of the Paris Water Supply has been executed in this style; so that it has received a certain stamp as constituting good practice. In these concrete pipes, the cement and a very clean, sharp sand are gauged in equal parts.

The result of the meeting of the Paris Gas Company on the 22nd ult. was the approval of the Chamon scheme by a large majority. The Board have been authorized to contract with the Municipality for the formation of the new Company, with a capital of £4,000,000, in co-operation with the Comptoir d'Escompte. The scheme has, however, to receive legislative sanction.

The members of the Medway Social Club had an interesting evening recently, when Mr. J. W. Mackay, the Works Manager of the Rochester Gas Company, discoursed to them upon "Gas Manufacture." Beginning with the early days of the illuminant, he proceeded to trace its course from the retort to the holder, describing the process of carbonizing coal, and the various appliances used in this and the subsequent operations necessary for the production of gas suitable for lighting purposes. Of course, Mr. Mackay had something to say about water gas, the nature of which, and the method of generating it, he fully explained. His hearers were doubtless astonished to learn that two-thirds of the gas used in the United States and Canada is of this kind; and possibly still more so to be told that one of its recommendations is that in its manufacture there is practical independence of labour. Mr. Mackay brought to his assistance a number of beautifully executed diagrams, by which he was able to elucidate some of the technicalities; and, at the close of the lecture, he was warmly complimented upon his clear exposition of the details of his subject. Such lectures as this are beneficial in dispelling many wrong ideas entertained by people in regard to gas, especially that produced by the latest method.

COMMUNICATED ARTICLES.

GAS MATTERS IN THE UNITED STATES.

Explosion Engines for Steamers.

I am just returned from a trip of nearly ten thousand miles, out and about in this huge agglomeration of independent, but closely allied, States. In making this trip, I have visited every large town from New Orleans to Duluth—not that Duluth is in any proper sense a large town—and from Portland, Maine, to Denver, Colorado; and I kept a careful diary of the most notable things I heard and saw. The first interesting thing happened before the train pulled out of the station at Jersey City, on the road to Philadelphia and Washington. I had left my section for that part of the car in which men may smoke; and was deep in my newspaper, when two men entered with the same intent. Their names are well known everywhere. Both are famous engineers—one builds ships, the other engines; and what think you they were discussing? They were considering the value of the explosion engine for the propulsion of steamers. They said "steamers;" the incongruity was not seen. Judging by their conversation, they had just come from one of the numerous establishments on the Harlem at which are built elaborate pleasure craft; and they were considering the difference in the space required by, and weight of, a steam-engine and boiler, and of an explosion engine of the same power with its fuel. They discussed the matter from various points of view for more than an hour; and finally, the man who builds ships said something thus: "I am not so sure about the ships, but I tell you the steam-engine business has seen its best days. It will not be long before you will see 1000-horse power gas-engines as common as 1000-horse power steam-engines now are. There is no reason why, by proper combination, you should not get four explosions per revolution." "Yes; you are right, I have made a few large gas-engines, and in some I used the penetrating rods and an explosion at either end of the cylinder. I am going to make some engines with four explosions per revolution. You wait and see." It was not without surprise that I heard this said, implying so plainly that at least one engine builder realized the change in position made by the new explosion engine.

Gas-Producers and Steam-Engines.

Not less than fifty conversations on gas-producers are recorded in my diary. Producers using anthracite coal, anthracite coal slack, bituminous coke, mixed slack and coke, and Illinois coal with anthracite slack are all mentioned. This subject seems to have been most surprisingly interesting to numbers of men; for, in addition to notes of conversations, I obtained two written descriptions of new machines, and sketches of still more—some of which, and a few photographs, I made myself. In a number of cases, these were of very small size, for a single small engine only. At other times, they were made for many small engines. I saw the plans of two producers in duplicate, with a small gas-holder to be used with a number of gas-engines in a building in which the demand for power is exceedingly variable—sometimes reaching to twice or even thrice the average demand in a few minutes; this excessive demand continuing for a short time only, and then as suddenly ceasing. As at present managed, a steam plant is required of sufficient capacity to supply the maximum demand possible, although that maximum may last only ten minutes; and the fixed charges of such a plant are high. It is believed that, when the new apparatus is installed, the reserve in the gasholder will be ample until the maximum of the producer demand can be met and brought into service.

Would any one have believed that the time was so near if they had been told—say, ten years ago—that, in this short period, steam was to be put on the defensive, when men would no longer plan to use steam if gas were laid on the building. Yet this has actually come to pass, even in New York; and everywhere the feeling is fast growing that the smoke nuisance cannot be properly met until the so universal use of steam for power has given way to an equally universal use of gas. The feeling, already wide spread, is rapidly growing, that, by the substitution of gas for steam, the smoke nuisance will be abated once for all; and this is the case not merely among "reformers" (*sic*) and doctrinaires, but also among the practical men—the engineers, and, above all, the property owners. The chief interest seems to have been excited in the South. For some reason, the people of the South appear to be keenly alive to the threatened smoke nuisance. They have only the soft and smoky coal; and they have decided feelings on the subject of smoke. Indeed, from what I have heard said, it would seem as if sentiment, and not reason, had been appealed to here—at least, beyond Baltimore, at which city I first encountered this feeling in any practical form. I had been invited to meet certain persons at dinner; and after dinner, we began discussing matters pertaining to our mutual interests. In the course of this discussion, I learned that certain men were engaged in erecting a huge manufacturing-block—(*anglice*) a building to accommodate a number of small manufacturing establishments. Instead of putting in a single steam plant to furnish power for all the tenants, it was proposed to instal a number of gas-engines—one for each tenant—letting each one pay his own gas bill, and thus pay for what power he really did use, instead of charging him a high rent, and making him pay for

power he did not use. It was freely expressed that such an arrangement would benefit both parties. This seems so entirely proper, and so business-like a procedure, that one feels surprise that it has been so long in coming. But, late or not in coming, it seems likely it has come to stay; and one is inclined to wonder why so eminently proper a proceeding is not the rule instead of the exception. It will evidently be less expensive for both in the long run, and most satisfactory to all concerned. It was openly declared by one man—an engineer who had made the subject a special study—that, were all men who use small steam plants making from 5 to 20 horse power to employ gas, the output of gas by day would be doubled, and the cost per horse power per hour reduced one-half.

From gas-engines, the conversation drifted to the Buffalo decision, and its inherent iniquity. It must be remembered that we were none of us lawyers; and the only ones interested in gas matters were two—I as a business man with something to sell, and another who "owned ten shares in some gas company." But the opinion was unanimous that it was unfair. All seemed to feel that, if it was an obligation upon the Gas Company to maintain meters in houses in which gas is not used habitually, and from which they do not collect a cent month after month—the electric light being the chosen method of illumination and the gas being held in reserve as the electric light was not considered trustworthy—then these meters should pay rentals, since it required just as much care to inspect them as if they were earning a maximum income. One man put the matter in a nutshell. "It looks to me like unfair discrimination. The electric light people charge me a fixed price as a minimum charge, and allow me so many amperes; then they charge per ampere after that. If they have this right, surely the Gas Company have the same right. Surely this is common justice." But common justice or not, it is not the present law in New York State.

Welsbach Burners *v.* Electric Light.

The next topic at the Baltimore dinner was a comparison of the Welsbach and electric light. One said that the chief advantage of electricity was that no match was needed to light it, and that it was much less troublesome than the Auer light. Others dissented from this, and one affirmed that the great advantage of the electric light was its sootlessness, or "soot-without-ness rather," he added. "Gas," so he said, "owes its handicap wholly to its sootiness, to which the Auer light is no exception." This brought out a chemist, who said: "This last is a most painful and pitiful truth. Splendid illuminant as the Auer mantle is, it is not a bit less a nuisance than the flaunting flame. When the light is burning with the enriched gas of this city, it always gives off clouds of smoke, which is none the less smoke because we cannot see it until it finds a surface to defile, which surface is usually the ceiling or some white hanging." "True enough," said the engineer. "The proper way to get rid of that is to legalize 5-candle power gas. When the power is reduced to 1 candle per foot burned per hour, the smoke nuisance will disappear, because none will be made. The nearly universal use of 'the flame with a petticoat,' the cheapening of the mantle by competition, and the substitution of other luminous substances for those now used—for if less luminous in theory they are quite as luminous in fact, under the present use conditions—has brought the mantle light within the reach of all who care to adopt it; and the small minority who insist on employing the naked flame should not be permitted to stand in the way of progress. With a candle power only a trifle less, with the naked flame, the smoking of the flame under the mantle could be effectually stopped. Indeed, much can be done for the mantle as it stands by improving the absurd way in which the gas is now consumed; but I am not going to say any more, only this: Until you can get a flame hot enough to burn all that comes from the gas-pipe, you will not better matters much. One or the other of two things must be done—change the burner, or reduce the candle power of the gas. My opinion is it will be well to do both."

The Buffalo Decision Again.*

Strange to say, this Buffalo case will not down. It is a Banquo's ghost—not so much, I think, to the gas men as to the lawyers and those interested in municipal affairs and contracts generally. Curiously enough, the lawyers seem dissatisfied with the decision, because, as they say, "it settles nothing." Nearly all with whom I discussed it—and they were by no means few—seemed already familiar with it in a way; but they all asked to see the clippings which I had with me, everything which has been printed on the subject. After reading them, they have almost all declared that, under the conditions, they did not see how any other decision was possible. They nearly all, however, without exception, said that, if the case were reopened on its merits, as it ought to be, and the pleas made as they might be made, a very different decision would be morally certain. This opinion seemed to be universal. I cannot be sure that it really was, but it seemed so to be, that no man had a right to require the Gas Company to go to the expense of maintaining a meter on his premises without using it, and especially if he not only did not use it, but showed that he had no intention of using it unless the kind of light service he much preferred met with an accident or proved deficient. This seemed an opinion held everywhere. In regard to the second point raised—that a gas company was a public service corporation, and thus compelled to furnish service—a great difference of opinion was evident. The proposition that a gas company was a public service corporation in the sense that a turnpike was a public service corporation, was denied quite as frequently as it was affirmed. "To say that a gas company is a public service corporation in a sense that a railroad is, is neither logic nor law," said a Washington lawyer. Indeed, the consensus of opinion outside of New York and Missouri was that the gas company was a public service corporation only so far as the streets were concerned. It was held by nearly all the lawyers from whom I asked opinions, and they were all ready enough to give them, excepting two men, one a Judge, who said that, as he had a very like case to decide, he was disbarred from giving an opinion, even in his private capacity, and the other a city attorney, who said that he had a case in process of development to test the same point in relation to the charges of an electric light company—that the gas company's relation to its customers was radically different from that of the railroad or express company, in that the proper performance of its duty required it to go off its own domain, off even from the public domain, and to enter on the premises of its customers, which was in itself a radical distinction between the two sorts of service. A Richmond (Va.) lawyer said: "Were such a case to come up in my business, I would not have gone into Court on the defensive, but would have sued the party for service rendered, unless he was willing to be served on terms fair to both parties." Then he went on to say: "Everywhere in the United States persons anxious to obtain franchises have made promises which those who tried to work the franchises have bitterly repented of when performance of such promises was demanded; but no set of men have got to suffer from rash promises as have the gas companies. With the electric light in the background, and the fixed hatred of the populace for the representatives of corporate wealth as a lever to work with, certain men, having nothing better to do, are attacking the gas companies, every one of which sees that their only salvation is the Auer light and a smokeless gas of low illuminating power. But to reduce the candle power, as they unquestionably should, would precipitate a storm of censure and a flood of litigation, which, in the present state of the public mind, they hesitate—and very properly, I think—to face."

Improvements on, and Substitutes for, the Auer Light.

About once in so often I am invited to examine a new mantle, or a new fabric, or a new burner, or a new way of using fabric or something which, in the opinion of the inventor or his backers, will bring in as much money as has the Auer light. Of course, I go to see them, speak as kindly as I can, and return home to wonder at the amount of wasted energy which is expended in threshing straw a second or third time to obtain wheat which has long since gone to the mill, or even to the oven. But never in the same length of time have I seen so many attempts to improve on the Auer light as during the past six weeks. Of course, all attempts to circumvent the patents are frankly abandoned; they are needless now. But the attempts to invent new fabrics and new ways of using old ones are simply legion. Everywhere I went, it seemed to me I heard of at least one man who had invented a wonderful burner or a wonderful lamp for the use of the fabric—always the same fabric in much the same shape. Only once, and that in New York, did I see anything else than an attempt to make an Auer mantle which was not an Auer mantle. But some things I did see which shows the line on which the ingenuity of this country is taking shape. While the authorized inventors are trying to intensify combustion, one person has conceived the idea that if 1 inch of fabric gives 20-candle power or 10-candle power, as the case may be, 2 square inches will give twice as much, and so on. Hence, 100 square inches will give as much light as an arc lamp, or twice as much, at infinitely less cost, since luminosity is equal in all parts of the fabric. Illumination is simply a matter of square inches; the intensity (the question of the candle-power per square inch) comes after. This invention is being developed. Another promising affair is a very large mantle, useful maybe for outdoor lighting; but so intense is the heat generated by the volume of gas consumed, that to burn it indoors would be preposterous.

It has occurred to me more than once to wonder at the number of mantles now offered for sale under various names in all parts of this city; but my journey convinced me that, as surely as London is not England, so surely is this city not the U.S.A. Of course, in a sense, New York City is representative. All the nations of the earth are presented to view in the daily panorama of its streets, and in this sense it does represent the country which is made up of an agglomeration of nationalities and languages; but it is only when one travels that one realizes there are districts in which English is a foreign tongue, and others in which it is never heard outside the four walls of the schoolroom—districts in which it is not even the language of the play-ground. This has been emphasized for me in my journey by the advertisements on the mantle-boxes, which are in many languages besides English.

These advertisements are as various as the mantles; and I have now on my table before me just nineteen kinds. Beginning with the 100-candle power Welsbach at 45 cents—say 1s. 10d.—and followed by the 80-candle Welsbach at 38 cents (1s. 7d.), and numerous others picked up on my journey, to the "Excelsior," carried about Chicago and St. Louis streets by hawkers at 10 cents, nearly every style and price is represented. When burning 3 cubic feet of gas, this 10-cent mantle gives about 25-candle power—a pretty fair illumination under the circumstances. It is an aluminium-chromium mantle, I think. It gives a warm light, very like that of a candle; and I was surprised to hear it said that this was the

* See "Journal," Vol. LXXVIII., p. 1592.

best mantle made, because "the light is comfortable and does not weary one's eyes." The glitter of the exceedingly bright 100-candle Welsbach is very painful to some eyes. When the Apollo people first began making mantles, they made one with a ruddy shade, and this pleased many people by its likeness in colour to an oil-lamp or naked gas-flame; but I presume they have ceased to make it, as I no longer see it on the market. It is to be noted that the reason the Welsbach people maintain their price is the excellence of their output. No one else makes as good a mantle, and no one asks so much for it. But to many buyers the cost seems prohibitive, compared with another mantle at one-half the price, which gives, so far as they can judge, light enough.

A conversation I have had, has set me to thinking whether the present pursuit of lights of extreme power is the best direction for progress. Is not Mr. W. C. Clarke right in saying that what is needed is a mantle which will give 10-candle power with ½ cubic foot of gas, not one which will give 100 candles with 5 feet? It is said that the Kern people made him a number of such mantles for use on his gas-machine, very similar perhaps to those designed and patented in England by De Lery; but they are not on the market, unless it be in connection with the said gas-machine. It has been whispered that the experiment did not succeed, and also that Mr. Clarke was called off by his employers, who were interested in other lights. Be that as it may, mantles are now made everywhere in the States. Wherever there is a city, there is a manufactory of incandescent mantles—sometimes half-a-dozen of them; and every kind of mantle that will shine when hot is being made. Business overdone? Well, that depends. If a man and his wife are able to make 100 mantles in a day, as a hawker in Brooklyn told me that they did, at a cost of 5 cents each and their labour, and the man can sell them the next day for 15 cents each (and he sold me one at this price), then surely some great change must before long come in this business. I am willing to admit that the mantle I bought was by no means a 100-candle power Welsbach; but what of that? It was better than none. Besides, a Russian Jew has been gathering in all the old Welsbach fixtures; and at his shop you can buy a Welsbach burner second-hand for 5 cents. With this and the cheap mantles, the very poor are to-day better off than the richest were only a few years since. How this will all end, I cannot say: but it is certain that in this city the mantle trade is rapidly being stratified, and the time is not far away when the Welsbach Company must buy up half-a-dozen makers, form a Trust, and produce a mantle which will sell for 10 cents (on the same lines as the best, but preferably of the chromium-aluminium class, as its light is more genial than any other), and force the men who make mantles in their back rooms out of the trade, or there will be no end of trouble for all—for makers, for sellers, and for users of incandescent gas-lights. Nor is the day far distant when something must be done. The very intensity of the competition threatens injury to the really established interests already. It is not the competition of the manufacturer with capital which will be the ruin of the Company, but the competition of the myriad of insignificant small workers, whose only capital is their skill and their brains.

The Question of Leakage.

At nearly every city where I stopped, I heard about the destruction of the asphalte pavement by the gas; and hence the leakage question. When one thinks how enormous is the loss from the loose joints, not to mention holes in the pipes, one cannot but feel the need of a remedy; and in view of the simplicity of the remedy, one can only wonder why it is not adopted. The remedy is fastening the pipes in position before the joint is run, and running the joint with a solder which expands when it cools. It is true that the big leaks occur with small pipes; but all the same, improvement is very much to be longed for in the jointing of large ones. It is stated by men who are said to be expert in such matters, that a very large part of the water loss in New York is caused by small leaks in big pipes. The huge leak reported in the "Journal" some months since was caused primarily by bad pipe-laying. Certainly there must be some way of closing these joints, even if type-metal were used to fasten them. If men are going on from day to day laying gas-pipes with no better method than the one which saturates the soil and the ground water so that the soil can be made to yield minute but appreciable parts of gas oil, methinks we need a better system.

NEW COMPARISONS IN FAVOUR OF COAL GAS.

By T. E. Pye.

Some weeks ago, following upon a conversation with a leading London engineer, it occurred to the writer to look up data upon which comparison could be made of the relative hygienic values of coal gas and electricity respectively as illuminating and heating agents, and to ascertain how far such comparison would be, if at all, favourable to coal gas. Investigations on the subject have, up to the present, not been remarkably encouraging. They have revealed a somewhat surprising amount of ignorance in relation to vital points, but have, so far, entirely failed to present much reliable information upon which the desired comparison can be based. In using the word "surprising," the writer does not mean as regards the general public, who naturally form their judgments upon observations made of apparent results and effects, appealing to the senses rather than to the causes producing such effects, but in reference to the utterances on the subject of contributors to scientific and technical publications, from whom we are surely entitled to look for sound reasoning and careful investigation in connection with matters dealt with therein, rather than the superficial treatment just referred to. But, so far as general conclusions are concerned, it is precisely the latter that we do find; and so it follows that the professional, medical, and artistic Press combine to acclaim the electric light as the superior, on all counts, of its older rival. So the public are naturally led, or misled.

The principal advantages claimed for the electric light in comparison with coal gas, which call for present attention, are, first, absence of combustion, and therefore of products of combustion; and, secondly, absence of heat. Arising from the foregoing is the

Alleged Hygienic Value of the Electric Light.

Discussion of this subject may be commenced with a direct challenge to all three of the propositions here submitted.

First as to the absence of combustion and of the products thereof. If there be any advantage in this, what may be the contrary disadvantages, as claimed by the electrician? These are, the elimination of oxygen from the atmosphere to feed the gas-flame, and the fouling of the air with "poisonous products of combustion—carbonic acid and other injurious organic impurities." This is the recognized formula, glibly trotted out on all and every possible occasion.

That oxygen is taken from the air and utilized in the oxidation of the constituents of the gas is, as in the case of all processes of combustion (human or otherwise), at once conceded. But the withdrawal of oxygen from the air by incandescent gas-lights is infinitesimal as compared with the cubical area of the space lighted—say about 1½ feet of oxygen per cubic foot of gas consumed, about 0·5 cubic foot of which is replaced by resultant carbonic acid, the bulk of the remainder being resolved into condensed water-vapour, thus inducing currents of fresh air into the apartment to take its place. Were it possible to conceive an apartment, the atmospheric conditions of which were such as to render appreciable to the occupants the abstraction of so small a quantity of atmospheric oxygen as that mentioned, such an apartment would not be habitable. Inasmuch as in no room or apartment to be tenanted by human beings should the air be renewed less than from two to three times per hour, such a contention is absurd and puerile.

As regards the resultant "carbonic acid and other injurious organic impurities," to begin with, carbonic acid gas is not an injurious organic impurity. The "Lancet"* gives the following: "The amount of carbonic acid gas in the combustion of coal gas is quite insignificant compared with that exhaled by the human individual. Of the two, *the human exhalation is much the more prejudicial to health.*† Dr. Whitelegge, in his work on "Public Hygiene," shows that the proportion of carbonic acid gas alone is not a satisfactory measure of impurity in the air. When present in excess (anything above 0·6 volume per 1000 volumes of air), it is to be regarded as indicating concomitant and injurious organic impurity, *of which it is the harmless index.* It does not, *per se*, begin to be injurious apart from organic exhalations (*i.e.*, from human beings) until a proportion of about 15 volumes per 1000 volumes is reached. *Coal gas yields little free carbon or organic matter.* To-day, in the light of more recent investigations with incandescent gaslighting, we may unhesitatingly say that coal gas yields *no* free carbon or organic matter. (*Vide* "Lancet.")

The sulphurous acid evolved is so fractional in amount, that, in intelligent reasoning, it may be ignored as regards injury to health.

Sulphurous acid is sometimes claimed as an aid to disinfection. A communication, under the name of a respected gas engineer, has just been addressed to several technical contemporaries in which this claim is strongly urged thus: "It is a fact that the action of sulphur upon disease germs is fatal to them, as demonstrated when sulphur is used as a disinfectant." The argument is a fallacious one, and is therefore dangerous. When sulphur is used as a disinfectant, it is so used as to yield sulphurous acid to the extent of 1·0 per cent. of the cubical contents of the room; and even then the disease germs are not satisfactorily disposed of. To make sure of the spores of bacilli, Koch tells us we must give full exposure to an atmosphere containing 6·0 per cent. of sulphurous acid for 24 hours—whilst *5·0 per cent. of carbolic acid in the atmosphere will do better work in five minutes.* Professor K. B. Lehmann, in "his Practical Hygiene" (as translated by Professor W. Crookes, F.R.S.), says "Sulphurous Acid"—*i.e.*, used as a disinfectant—"acts only in very large doses, and on prolonged application." It is to the carbolic acid and the tarry vapours, in the writer's opinion, that Mr. Harman should look for the explanation of the "tunnel air" incident to which he refers—and not to the sulphurous gas at all. There are, surely, but few parents who do not know of the almost magical relief afforded to infants suffering as he describes, by vaporization of carbolic acid or cresolene. His reference to practices on the gas-works confirms this.

Secondly as to the absence of heat. It is exceedingly doubtful whether a claim in this respect can be maintained on any count whatever. Heat induces circulation of air, and combustion induces actual renewal of the air, and therefore more or less

* Vol. 1898 (I.), p. 445.

† The italics in the several quotations throughout this article are mine.

ventilation. It is true that, under the old system, crowded halls and mercantile offices were rendered uncomfortably hot by the presence of large numbers of open gas-flames. But even then, the flames simply emphasized a necessity for better ventilation that is bound to obtain in every building wherein a number of human beings congregate. By taking them away and substituting the electric light, the conditions may be, and probably in many instances are, more comfortable than before. But the serious atmospheric conditions previously made abundantly manifest by the heat from the gas-flames, and thus calling loudly for improvement, remain—not unchanged as before, but a thousand times worse than before; and none the less so because of the enhanced "comfort," which leads to no further trouble being taken or investigations made. The old trouble is left to fester unsuspected, and the foul air to become fouler still, owing to the removal of the corrective operation of the gas flame. For it is often overlooked that in addition to its action, already noted, of inducing fresh air to replace the heated and condensed products of combustion, *a gas-flame is a sterilizing agent* of much value.

Dr. Whitelegge, in the work already quoted, states that "experiments of Koch, Parsons, and others, have shown that even spores of bacilli are destroyed by exposure to steam at a temperature of 212° Fahr., or to hot air at a temperature of 220° Fahr.;" while Professor Lehmann gives the following as regards the bacilli of tuberculosis, which he finds will die by exposure to 131° Fahr. in four hours, to 140° Fahr. in one hour, to 158° Fahr. in ten minutes, and to 203° Fahr. in one minute.

Observers of the heat intensity of an ordinary gas-flame will at once appreciate, from these figures, the enormous purifying power (as regards disease-germs) exercised, in a crowded hall, by a large number of gas flames. It should, of course, be remembered that every flame is in itself a centre of air circulation; and it is probable that a very large proportion of the air contained in a room lighted by gas finds its way either to the flame or sufficiently within its sphere of action to be thoroughly sterilized before passing away or being inhaled by the occupants. Compare such conditions with those obtaining to-day in many large halls electrically lighted. This point has by no means received the attention of the medical faculty that its importance warrants; but that it is not quite overlooked is shown by the following: In the "British Medical Journal," Dr. W. A. Aikin—writing upon the change of lighting of large halls, &c., from coal gas to electric—communicates the following: "The atmospheric conditions are now quite different, for the whole contamination is the effect of human exhalations . . . such air becomes unfit for respiration much earlier than when carbonic acid alone has to be considered, *and the necessary air change is certainly retarded by the absence of gas-burners.*"

The foregoing remarks have not touched on such establishments as are gas lighted and ventilated in combination by the same agency. In such cases, all products of combustion are carried away immediately; and the heat therein contained is utilized in the further removal of the exhalations from the human occupants, and in inducing into the building large volumes of fresh air. Of course, the objections just dealt with are never urged in regard to these combinations; electricians themselves realizing the important and valuable aid to the healthiness and comfort of the occupants, which is provided by so efficient and natural a system.

As regards the relative values of the two agents for *heating* purposes, gas undertakings have not as yet felt the competition so keenly as in the lighting world. But the same conditions, as just noted, still apply—*only more so.* The writer has had some considerable experience with electrical heat radiators. Without discussing the merits or otherwise of the system, it is accepted that, for heating a floor space of (say) not exceeding 150 square feet—the height of the room averaging 12 feet—an expenditure of current of one Board of Trade unit will, at the very least, be necessary. This is without allowance for any material change of air in the apartment. These radiators, of course, induce absolutely no ventilation, and very little circulation of air. The air in a room warmed in this way may thus be churned over and over again with practically no sterilizing effect, and possibly no further renewal than is afforded under the ordinary law of diffusion. It is a bad gas-fire indeed that will not do quite as much *effective* warming up, at from one-fourth to one-sixth of the cost of the electric heater; and at the same time will be inducing air currents up the chimney that will ensure a constant flow of fresh air into the apartment. This applies, more or less, to all types of asbestos or similar gas-stoves; and in the condensing type—where a flue is not used—there is the enhanced sterilizing of the air to partially compensate for the absence of heated flue action.

Sufficient has now been said to show that there are at least two sides to the question; and it would be exceedingly interesting to ascertain what the actual atmospheric conditions are in many of the banking and mercantile offices, churches, chapels, theatres, &c., of our large towns, now lighted by electricity, as compared with those of other similar establishments lighted by gas. Any communications on the subject, that readers of the "JOURNAL" may see their way to contribute, will be of value in adding to the present small "sum of knowledge," and will justify this effort to open out what is undoubtedly a matter of great interest.

The seventy-second annual meeting of the British Association will be held at Belfast from the 10th to the 17th of September, under the presidency of Professor James Dewar, F.R.S.

TECHNICAL RECORD.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Annual Meeting of the Association was held on Thursday at the Cannon Street Hotel, E.C. The extensive fog which prevailed in and around London had no detrimental effect on the attendance; nor did the change in quarters from the Holborn Restaurant—the members, in fact, came in representative numbers from all parts of the scattered district. It was a matter for much regret that the retiring President (Mr. Corbet Woodall) was unable to be present; and, in consequence of this, the new President, Mr. W. E. PRICE, of Hampton Wick, took the chair from the commencement of the proceedings.

The HON. SECRETARY (Mr. J. W. Helps, of Croydon) presented the minutes of the last meeting; and on the motion of the PRESIDENT, seconded by Mr. S. Y. SHOUBRIDGE (Lower Sydenham), they were confirmed.

ANNUAL REPORT.

The HON. SECRETARY next read the annual report of the Committee. To a large extent it was a review of the work of the past year. Regarding other matters, it was mentioned that since the last report one member had resigned, and 13 new ones had joined; so that the Association now numbered 165, as compared with 153 this time last year. Referring to the November meeting, and to the report presented by a Sub-Committee appointed on the subject of the formation and deposition of naphthalene, the Committee said it was most devoutly to be hoped that the investigation which it was proposed to institute might, even if it did not teach gas managers how to free themselves altogether from the trouble, at least greatly minimize it. Should this be so, the result would be recognized as a permanent memorial of Mr. Corbet Woodall's most successful year of office in the Association. The Committee were pleased to note the ever-increasing interest taken by members in the work of the Association. As to financial matters, they stated that the balance standing to their credit at the beginning of 1901 was £99 12s. 8d. The total expenses during the year amounted to £77 8s. 8d., and the receipts to £81 7s. 6d.—leaving a balance in hand of £103 11s. 5d.

The PRESIDENT, in proposing the adoption of the report, said they must congratulate themselves upon the work of the past twelve months. The report was a very encouraging one; and it showed the Association were anything but moribund.

Mr. T. MAY (Richmond) seconded the motion, which was unanimously carried.

The PRESIDENT said his next duty was one of the most pleasant he expected to have to perform during his year of office. It was to propose a vote of thanks to the retiring President, Mr. Corbet Woodall. He could only regret that Mr. Woodall was not present to hear the way the members would receive the proposition. In a letter, their late President said he had had little expectation of being able to attend the meeting, but had indulged the hope until that morning, when he found it was quite impossible. The letter (which was addressed to Mr. Helps) continued: "Will you give my kind regards to the President and my best wishes for his year of office. I wish I could have been more active in the performance of my duties during the year; but each year seems to find me less able, rather than more, to follow my own inclinations, and to do the work I should like to do." Proceeding, the President said, they had all, individually and collectively, derived immense benefit from Mr. Corbet Woodall during his year of office as President They hoped against hope before he consented to take the chair; but, by a little judicious pressure in the right direction, he was kind enough to do so. Though Mr. Woodall said that he had benefited thereby, he was sure the members would all consider that they had done so to a much greater degree. Mr. Woodall's address at the beginning of the year was a pattern one; and his kindness when the Association visited Bournemouth was most noticeable. At the November meeting, too, he assisted very considerably in the discussions which then took place.

Mr. F. G. COCKEY (New Swindon) seconded the motion, which was carried by acclamation.

DEATH OF AN ORIGINAL MEMBER.

The HON. SECRETARY said his next duty was not a very pleasant one. It was to report the death of an old member of the Association. He had a notice some time ago from Mr. Farrand, jun., that his father had died. He (Mr. Helps) at once wrote expressing his own personal feelings of sympathy; and at the same time he said he was sure the members of the Southern District Association, when they heard of Mr. Farrand's death, would also wish him to convey their sympathy. Many of the members knew that Mr. Farrand was one of the originators of the Association. He was one of the few who met in the room at Richmond to start the Association, and for many years he took a great interest in it. He (Mr. Helps) felt he might be allowed to move the vote of condolence and sympathy with the members of Mr. Farrand's family in their bereavement, seeing that Mr. Farrand was at one time Engineer and Manager of the works of which he (Mr. Helps) now had charge.

Mr. J. L. CHAPMAN (Harrow) seconded the motion, which was carried by the members silently rising.

The PRESIDENT then delivered his

INAUGURAL ADDRESS.

Gentlemen,—It is with mixed feelings that I take this chair, allotted to me by your kind vote in November last. I am deeply sensible of the honour you have bestowed in electing me to be your President during the ensuing year; and I thank you sincerely for that honour. I shall strive hard to maintain this chair during the coming twelve months in the position it holds, and has always held, among the Associations of Great Britain. Gentlemen who have held this proud position are to be found among the most respected in the profession; and their names make an honourable list. If a distinction be allowed, who more honoured than the gentleman I now succeed? This fact, however, induces feelings of incompetence; and I am sensible of the difficulty of maintaining the standard. For all shortcomings and failings, I ask your indulgence and forgiveness.

The Southern District Association of Gas Engineers and Managers (to give it its full title) has a long and distinguished past. It was formed in July, 1875, at a meeting of gas engineers held at the Richmond Gas-Works; the gentlemen present being Messrs. Eldridge, Farrand, Packham, E. Price, Scott, Martin, Wadeson, Botley, and Chapman. Our much respected and long lost friend Mr. Eldridge took the chair. The late Mr. A. H. Wood, of Hastings, was the first President; and Mr. James L. Chapman made an excellent Secretary for twelve years from the commencement. The Association is second in the age order of English Gas Associations, as well as in the matter of membership, and claims as members most of the best-known names in the gas profession.

Dismissing this small but important section of history, let me issue a plea—Why is not the membership roll larger, and why does it not contain all who are eligible? Are there not gentlemen within 100 miles of London to whom it would be a benefit and a credit, both to themselves and to the Society, if their names were found in the book of members? A society is never so large, and the knowledge of those composing it is never so great, that it can afford to leave without its pale one individual, whether he be a greater or a lesser star. With one exception, the great London Companies are well represented in the Society; and great has been (may I say?) the mutual benefit. But why the exception? There is a Gas Company—and not a small one—situated on the north of the Thames, whose representation in point of numbers is most meagre; and yet it contains many men whom the Association would receive with a warm welcome. Why do they not come in? Can it be that their field of view is so vast, or the day so short, that they have neither the time nor the desire to come among us. No; I think it is neither of these reasons. I trust this reference will be taken in the light of a reminder by all gentlemen in the area of the Association; and provided they comply with the limits of eligibility, as found in our rules, I think I may say, in the name of our Society, that they will receive a hearty greeting.

The work of the Association since its formation has been such that no member need be ashamed; and our thanks are due, and are given, to those gentlemen who have contributed towards its proceedings. But still more good work is needed. We have heard from time to time that our worthy Hon. Secretary (Mr. J. W. Helps) has had difficulty in obtaining papers from members. This should not be; and I trust all will see that his labours in this direction are easier in the future. Surely there can be no reason for this difficulty. Certain is it that it is not want of subjects. We need not go far through a week's routine, either in the engineering or management branch of our profession, to find many a subject—be it success, failure, or impression—which will make excellent matter for debate, and to the benefit of both the introducer and those who are present.

Nervousness, and a feeling that the subject will not be of sufficient interest, or that it is well known and of too slight importance, is a general fault. Nervousness is common to us all, I suppose, and is responsibe for much inaction. But this is not overcome by retirement; and he who wishes to be able to debate must speak. The subject may be considered unimportant; but this is generally a mistaken idea, and often one finds that a difficulty, which one considers singular, is shared by not a few. I therefore ask members—juniors as well as seniors, and especially the former—to come forward with papers on subjects for debate, to a greater extent than in the past, so that our meetings may be the more attractive and useful. My invitation is given specially to the junior members of the profession, as it is they who need encouragement and help, that they may in the future become more and more creditable engineers, capable of interpreting the signs of the times, and successfully coping with the problems of the day; for the difficulties of the future are not likely to be less than those of the past.

The struggle for existence is becoming keener every day, both individually and collectively. The gas engineer of the past and present has had an easy path compared with that which has yet to be trodden. The day of independence in the business of gas lighting is passing, if it has not already passed; and we must each and all look to it, if we are determined not to permit a competitor to tie or pass us. In the past, the protection of a beneficent Parliament, and the superiority of the illuminant supplied by the gas companies, placed them in an unassailable position; and they were content, generally, to sit at home for custom.

In a progressive nation, and particularly in science, absence of competition was not likely to be permanent. Other methods of illumination were devised, and great improvements in the manufacture of gas have developed. The gas company who are not found equipped, or the gas engineer who does not by continued effort keep himself posted and practised in the advancement of science, thus improving the equipment, will find themselves left, and that which is more progressive will supplant them. Every year we see competition becoming more keen, and Parliament naturally and reasonably withdrawing the (so-called) protection of monopoly. The gas engineer does not mind this. He is quite prepared to meet all competition that is fair and square. He knows he has a good article to supply; and, given a fair field and no favour, he is confident he can hold his own in any market. Therefore I say to the junior members of the Association—Bring your difficulties, your improvements, your impressions, to the meetings. Let them be commended or torn to pieces by your fellow engineers. The benefit will be mutual; for only that which is of value will survive.

In connection with this, the subject of education naturally arises in one's mind. Great alterations in the methods of both primary and secondary education have taken place during the last few years; but still greater advancement will have to be made. Many methods have been advocated, and numbers have been tried. The opinions of authorities are yet at variance; and each school is considered by its advocates the best. We are continually being reminded of the Continental standards, and especially that of Germany. Yet, after all, I suggest that old England will not be found one whit behind the best of them. We are reminded, too, of the mental calibre of the German, and his great advance in technical education; but can it be shown that we rank second to any? In chemistry, in particular, thanks to State aid, Germany is known to have made great advances; and in the branch of chemistry which more immediately concerns gas engineers—viz., that of coal tar—their discoveries are famous. But have they thereby increased the market value of coal tar?

Great credit is doubtless due to him who makes two blades of grass grow where one alone had grown before; but even more praise is due to the man who finds a market for the increase, or, if not found, makes one and maintains the value. Englishmen may appear to be slower in their rate of progression; but they are sure, and take time to divide the chaff from the wheat. Take, for instance, what may be called a new industry—that of the designing and manufacture of automobiles. Owing to a restrictive Government, until 1896 it was illegal to run a motor car on public roads; and as a consequence, France, where no such restrictions existed, has been able to take a long lead. To-day, however, though it be but five-and-a-half years since the repeal of the afore-mentioned Act, English cars are as good as those imported from France, and by some considered to be of better design.

So great has been the advance in science during the Victorian Era, that the student of to-day is almost overwhelmed with the knowledge he has to absorb. He is compelled to specialize, and, given a sound primary education; this is well. It is better to be thorough in the science which is to be a tool when the time of initiation is passed, than to have an imperfect or superficial knowledge of all the arts and sciences. I do not wish to be misunderstood. I am now speaking of the education of the student subsequent to a thorough curriculum of primary education, which to-day includes a more or less general knowledge of the arts and sciences. We see with satisfaction the methods adopted for the training of young men who have selected gas engineering as their path in life; and the various Polytechnic Schools are doing good work. Their methods of training and their examinations are appreciated, if the number of students who present themselves is an indication.

There are excellent text-books, wherein much information is contained; but did one ever find a text-book to be all that is required? It is well nigh impossible to insert in them the information necessary to settle the multitudinous questions and difficulties which arise. I am pleased to see a method of acquiring information by correspondence has come into favour, whereby the student who so desires can communicate with some acknowledged expert, and by him may be directed in the best lines of study. The master can question the student, or the student the master; and thus difficulties which remain such when books are the only reference, are dissolved. Perhaps the technical journals could do more in this direction. I suggest it as being well worth their consideration.

During the period of special study of the science of gas making, or subsequent to it, according to circumstances, the student will, if he be wise, attach himself to some works where that which he is learning in theory will be seen in practice; and fortunate is the young man who obtains a position in works where the latest and best is found. These works need not be where gas is manufactured. Indeed, it is better that for a period of the students' early apprenticeship a gas-works should be avoided, and that general engineering practice should occupy his attention. Let him move from works to works, where he can not only see the various occupations of the engineer, but find a scope for his natural energy and capacity. Contemporaneously with his initiation into the ever-improving methods of the civil engineer, he should experience the ways of the British workman, and early learn his direction and control. A man who can extract a good day's work from the artisan and labourer, as he is found to-day, has succeeded beyond the average. After general engineering

has occupied the attention of the apprentice, he will naturally migrate to gas-works wherein to specialize; but even when he has thus far proceeded in his period of initiation, he should not be content to crystallize.

One gas-works, be it ever so well appointed, does not contain all that is best. Small works are as useful as large ones in which to learn what to avoid, as well as what to accept—indeed, I would rather say, more useful. In a large works, the pupil is often appointed to special work, and has but little opportunity of ascertaining the general routine of the establishment. He therefore becomes over-strong in one department, and equally weak in another. Text-books or technical journals are invaluable, and indeed, indispensable; but they cannot convey so vividly the needs of the special occasion or the methods of the individual instance as a close and practical inspection. It is during these periods that the grit which we believe is to be found in most Englishmen has opportunity of showing itself, and common sense and gumption to develop. If this is not the greatest reason for apprenticeship, it is at least of much importance.

Experience is greatly to be desired. But this can only come by living through it; and therefore in the course of time, the young man with common sense, and the intuitive capacity of doing the right thing at the right time, is more to be desired than the older man who has no eye for the signs of the times, or the capacity to discern the direction of the current. I fear to weary you; but the importance of being prepared for that which is before us, is my plea. If the British nation is to hold the position which has been, and is, the envy of the world, it must see to it that it produces expert men (and I do not suppose there is one here who will deny that the engineer is the most important of all specialists), who are capable of holding their own in the world's markets.

Running one's mind over the occurrences of the past twelve months, a few matters stand prominent. The price of coal is a subject which has special interest for all of us. That it has been a matter demanding more than ordinary consideration and watchfulness during the past year or two, is a statement which none will gainsay. At the end of 1899, there were signs that the market value of coal was increasing. This was due to various causes; the commercial prosperity of the country, and the uncertain aspect of affairs abroad being the greatest. The ultimate extent of the rise during 1900 came, however, as a general surprise. Thanks to a mild winter, the demand was not abnormal, or probably the quotations would have equalled, if not exceeded, those of 1873. In the table which is given below, I have stated the average quarterly prices of Northern coal, as quoted weekly f.o.b. at Newcastle. I cannot guarantee that the figures are absolutely correct, as at times it is very difficult to obtain quotations at all; and the prices given in the weekly reports are often influenced by preponderance on the market of a certain quality. However, taken as an average, over quarterly or yearly periods, the figures are relatively correct.

Price of Northern Coal f.o.b. Newcastle, in 1899, 1900, *and* 1901.

—	1899.	1900.	1901.
	s. d.	s. d.	s. d.
Lady-day	8 8	16 9	11 1
Midsummer	9 3	16 10	9 10
Michaelmas	10 0	17 1	11 10
Christmas	12 11	16 0	12 5
Average for year	10 2	16 5	11 3
Lowest quotation in year	8 6	13 3	9 3
Highest ,, ,,	15 3	18 6	13 6

The average price in the current year up to last week is 10s. 9d. The market is evidently on the downward grade; and let us hope it will continue to follow on a little further in this direction. The period for making contracts for the ensuing twelve months is close at hand; and the direction of the market will be of more than ordinary interest.

I almost fear to mention the subject of electricity. It is difficult to find a Presidential Address of late years which has not contained a reference of some kind to this; and I have no wish to labour the subject. Whether this source of illumination has progressed commercially during the past year is very much a question of opinion. The majority of installations in this country being in the hands of municipal authorities, it is not easy to ascertain results. But loss on the undertakings appears to be more general than profit.

During the last few years, corporations and councils seem to have been attracted, as the moth to the candle, and have rushed into the electric light business with promises of large profits. The results, however, have generally fallen far short of the estimate; and the ratepayers have thereby suffered, and will suffer more. The authorities have probably conformed to public opinion, as it has been quite the fashion to desire the electric light; and the town that is without it has been considered old-fashioned. There are indications that a change is taking place; and local authorities do not appear so keen on giving a municipal supply. The experience of those who have adopted this plan is influencing those who are contemplating the step; the consequence being that private electric light companies are doing more business. The authorities think that if there is money to be lost, they will kindly allow the shareholders to be the losers.

The electric light for street illumination is not a success, compared with the incandescent gas-light; and this is even admitted by the electricians themselves. Comparatively little of it is seen in the thoroughfares, even where the undertaking is owned by the local authority, where any regard is had to expense. The gas industry has much to be thankful for in the invention of the incandescent mantle—coming, as it did, just at the right moment. At the period of its introduction, the electric light was making great headway in street as well as house lighting; and compared with the flat-flame, which was the general form of gas illumination, it was reasonably preferred. Ingenious inventors saw the position, and devised methods of consuming gas by regenerative and other lamps; and great credit is due to them for their work. The incandescent burner, however, proved after trial to be superior to them all, both in illuminating power and cost; and in its improved forms gas engineers have the satisfaction of knowing that theirs is the best and cheapest light.

The use of the incandescent gas-light is increasing by leaps and bounds, and will extend till the flat-flame is the small exception. We in England are severely handicapped by the price of mantles. We know, however, that this is but temporary. Let us hope that those who are responsible for the present price in this country will hurry up and conduct their business in a thorough and commercial manner, so that England may compare favourably with the Continent. The Briton is notably long-suffering and law-abiding. Hitherto he has paid high prices for mantles; and, if without complaint, at least with the hope of an early reduction. Lately he has been vividly reminded that, while he has been thus suffering, financiers and others have been at work conducting the business in a manner which does not commend itself to the best commercial judgment. He has, therefore, begun to complain; and this is but a preliminary to action. Indeed, if I read the indications of the past few weeks aright, interesting developments are likely to take place in the near future.

I cannot let this opportunity pass without repudiating the statements which have been made by those—or some of those—who were until lately responsible for the direction of the Company who run the monopoly of the incandescent mantle in England. It has been repeatedly stated that gas companies are antagonistic to the incandescent light, because it is economical in gas consumption, and they therefore fear it will hinder increase in business. This is an insult; and I take this opportunity of flatly contradicting it. A tremendous increase in the adoption of incandescent gas lighting has taken place during the last few years in both streets and houses, and this mainly by the advice, and under the direct supervision, of gas companies; and I am not aware that profits have been reduced thereby. If there is any complaint to make, it is rather that the attitude of the Company at Westminster has been such as to render the conduct of business with them on a smooth and pleasant basis well nigh impossible. It is to be hoped that the new blood which is being infused into the somewhat inflated veins of the great monopoly will have the good sense to make better friends with a customer who, if not the largest at the present time, bids fair to become so in the near future.

As the incandescent burner is at present constructed, it is evident that its maintenance by gas companies must be undertaken; otherwise many consumers will throw it aside as being troublesome. They have neither knowledge nor inclination to attend to them; and consequently they are abandoned. I am glad to see that a number of gas companies have already adopted some method of maintenance, though there does not appear to be a unanimity of opinion as to which is the best. The plan of a fixed charge per burner, including the provision of new mantles, does not appear to me to be an ideal one, inasmuch as the householder has no interest in the length of their existence; and efficient check on the number of mantles used by the company's inspector is difficult. It has, however, been adopted in several towns, and I understand is giving satisfaction, though information is scarce as to the financial results.

The system of a fixed charge per burner per quarter for attention—such as cleaning, adjusting, &c.—with an additional charge for the mantles used, appeals to me as being more satisfactory. With this, the consumer is interested in the life of the mantles; and he is more likely to see to it that they are reasonably treated, and, further, a better check is possible on those deputed to the work of maintenance. An interesting account of the result of this method appeared in the "JOURNAL OF GAS LIGHTING" for Feb. 25.

The maintenance by gas companies should not be confined to incandescent lights. Flat-flames, until they become obsolete, should receive attention; and good governer burners should be fixed at a nominal charge or free. In some cases, this is being done. That this interest in the consumer will bring its own reward, I am convinced; and though the maintenance or burner account, when balanced, may show a loss, the balance will be on the right side when the improved relationship between company and consumer is taken into consideration.

It is the gauze at the top of burner, where dust accumulates to such an extent as to almost stop the passage of gas, which is the chief source of trouble; and it should be discarded. There are burners already on the market which dispense with this dust-trap, and which are pronounced improvements. I have used such an one for the past nine months, and it has required no cleaning; whereas another employed under similar conditions needed attention at least every month.

The slot gas-meter is a mechanism which interests most of us

commercially, and many mechanically. If ten years ago it had been prophesied that this instrument would in the next decade be in use to the extent of tens of thousands, the prophet would have received his customary reception. Such there were; and I had the temerity to be one of the earliest—suffering accordingly. I lodged my first application for a patent in November, 1887; being second to Brownhill, who is recognized as the first to apply prepayment mechanism with the insertion of a coin to the sale of gas. Unfortunately, we were premature; there being no demand for such an apparatus. It took some years to arouse sufficient interest to get a trial; gas companies scorning to sell gas by pennyworths. True in this case was the proverb that "It takes a long time to make an old dog learn new tricks." Ultimately, however, a few of the more progressive gave the meters a trial, with the results we all are cognizant of.

Previous to the introduction of the slot meter, we were constantly reminded that we had two competitors—electric light and oil. The present position of the first named I have already dealt with; the second we hear less of to-day, thanks to the prepayment meter. In the endless rows of small houses in our cities and towns we were wont to see the treacherous oil-lamp; but now this has been largely superseded by the prepayment meter. The tenant is provided with a clean and healthier light, and an ideal means of cooking and heating. This change is not only to the benefit of the occupier, but to that of the community at large, as the cottage chimney emits less smoke, and the air is purer.

Frequent has been the complaint that the atmosphere of our towns is unnecessarily smoke-laden; and extraordinary have been some of the proposals to purify it. There is only one practical method, and that is the universal adoption of gas for cooking and heating. When this is an accomplished fact, city fog, to which we so strongly object, will be a nuisance of the past—or, at any rate, will be clean.

Great credit is due to those companies who have been unstinting in their outlay on slot-meter installations; but I fear many are feeling the effects of a great increase in capital expenditure—indeed, in some cases they have ceased to expend any more money on this object. This is unfortunate. Had they been less lavish in the earlier installations, they would have been able to continue the work and yet receive a fair interest on the capital expended.

There are signs that a demand has been created; and now the tenant considers the builder is behind the times if new property does not contain convenience for the use of gas. It is therefore becoming customary to pipe small property, where a few years ago it was considered quite unnecessary and extravagant.

If to-day the demand for gas is large, and undoubtedly it is in greater favour with the public than ever before, what is it likely to become when the selling price is largely reduced, owing to the calorific standard being substituted for candle power? That this change is certain to take place, none can doubt. The best thanks of the gas profession are due to Mr. George Livesey for the initiation of the movement to reduce the illuminating power of lighting gas in England, and the strong stand he has made in Parliament to attain this reform, in spite of the opposition of the London County Council and others.

Many other subjects which do or will require the serious attention of gas engineers in the near future occur to my mind; but I fear I have already outrun your patience. So with best thanks for your careful attention, I bring this address to a close; trusting in what I have put before you there may be one thought you will regard as worthy of second consideration.

At the close of the address,

Mr. W. D. Child (Romford) asked the members to join him in according a hearty vote of thanks to the President for his address. Mr. Price was an old member of the Association; and his ability as an Engineer fully qualified him, a number of years since, for the position of honour that he now held. The honour so long delayed had now come. In his address, the President had made some most valuable suggestions, which would be of use to the members generally.

Mr. J. Tysoe (East Greenwich) seconded the motion, remarking that the President had given the members a strong, practical, common-sense address.

The motion was carried with applause.

The President, in a few appropriate words, acknowledged the compliment.

THE NAPHTHALENE INQUIRY.

The Hon. Secretary said the President had asked him to say a few words with regard to the circular that had been issued to the members on the subject of the naphthalene inquiry. As they were aware, it was only a few days since that the circular was posted; and they had had little time to get in replies, because, in the case of some of the members, the directors' meetings were probably held at rather long intervals. At the same time, he was glad to say they had received a fair number of answers; and he was also pleased to say that, with one exception, they were favourable. Most of the engineers promised, on behalf of their Directors, that not only would they subscribe something on the lines suggested in the circular, but that they would do all they could to further this inquiry by placing their works at the disposal of the Committee. The Sub-Committee had not forgotten their duty to the Association. They had been reappointed; and he did not think the Association intended for a moment to let the thing drop. They had made a start now; and what they could do, they intended to do, as thoroughly as the means which would be placed at their disposal would allow.

The President said it was a little too early to make a statement on the subject; but if any points or suggestions had arisen in the minds of any of the members, he would be glad to hear them. [There was no response.]

The following is the circular which has been distributed among the members of the Association:—

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

Gas-Works, Croydon, Feb. 24, 1902.

Dear Sir,—The subject of the serious inconvenience to both gas companies and their consumers caused by the formation and deposition of naphthalene, either on the works, in the district mains, or in the consumers' service, has received the careful consideration of the Committee of the above Association, who presented a report at the last meeting, which was adopted and power given them to proceed further on the lines suggested.

In view of the increasing competition of other methods of illumination, the Committee feel that the effect of the inconvenience caused to gas consumers by the frequent stoppage of the supply of gas by naphthalene deposits is of serious importance, and is not to be measured by the cost of the necessary attention on the part of the gas company, but rather by the tendency of such inconvenience to lead consumers of gas to adopt some other means of illumination.

With a view of arriving at those conditions of working and distribution which may favour or prevent the deposition of naphthalene, it is proposed shortly to issue to members a tabulated list of questions, and, on answers being received, to select a few works (which shall include some where no trouble with naphthalene is experienced) where a methodical and careful series of experiments shall be conducted by a thoroughly qualified expert, who will draw up such a report as will doubtless enable the Committee to offer to the members much useful information, and to suggest means whereby the difficulty may be overcome.

To carry out this plan, it is of course necessary that ample funds should be at the disposal of the Committee. It is, however, believed that there will be no difficulty in raising the necessary amount, especially when it is considered how great would be the advantages reaped by the outlay should the hopes of the Committee be realized.

It may be mentioned as a guide that should all the companies represented by the Association subscribe, a contribution at the rate of about 1s. per million cubic feet of gas made per annum would provide the funds necessary for the purposes of the investigation, and in this calculation the large London Gas Companies are purposely omitted.

The Committee, therefore, desire me to request you to lay this letter before your directors, and to ask them to carefully consider the question with a view to their subscribing to the fund which it is proposed to raise. My Committee are also desirous of knowing whether your directors would permit experiments to be carried out at their works should such a course be deemed necessary, and also whether you would personally do your best to forward their endeavours by lending them all the assistance in your power.

I shall be glad to receive a reply at your convenience.

(Signed) J. W. Helps,
Hon. Secretary and Treasurer.

FURTHER EXPERIENCE WITH REVERSIBLE CONDENSERS.

The President said they had now come to the last item on the *agenda*—that was, the discussion on the paper by Mr. Carpenter on "Further Experience with Reversible Condensers."* It would be remembered that the paper was read at the November meeting; but, owing to Mr. Carpenter's absence, the discussion was adjourned. He would ask Mr. Carpenter to open the discussion with a brief explanation.

Mr. Charles Carpenter (London) said, in response to the President's invitation, he had pleasure in adding a few words with reference to the diagram which described the reversible condenser. It was unfortunate that he was unable to be present at the last meeting; but his absence arose from unavoidable causes. The condenser consisted of rows of vertical tubes, each of which contained other small tubes, through which water passed. The novelty of the condenser lay in the fact that it was an extension of one which he described at a meeting of the Association some few years ago. Diagrammatically, they might consider the condenser was in the form of a horseshoe; and the inlet and outlet valves were so geared that the current of gas could be reversed at will through the horseshoe. That was the novelty about the condenser; and it was that reversing which brought about the advantages which he had claimed in the paper.

Discussion.

Mr. J. W. Helps (the Hon. Secretary) said he had received a letter from Mr. C. F. Botley, of Hastings, stating that he was unavoidably prevented from being present He enclosed a communication on the subject which he asked should be read.

Mr. Botley's communication was as follows: In view of a personal experience on somewhat similar lines, I have been much interested in this instructive paper, for which we are indebted to Mr. Carpenter. Much valuable data is given us, and Table C shows the tendency of modern carbonization to increase the amount of naphthalene produced. A condenser of the design adopted by Mr. Carpenter, with the ingenious double-seal box, is very efficient; hence its success. This really appears to me to

* See "Journal," Vol. LXXVIII., p. 1306.

be the secret of the whole matter. With a parliamentary standard of only 14 candles, Mr. Carpenter need not, of course, fear severe condensation. In connection with naphthalene, the following points regarding this condenser appear important—viz., it is worked under pressure or on the outlet of the exhauster (favourable to the deposition of naphthalene), and the success attained appears to be more in regard to stoppages on the works than in the district. I recently pointed out in the "Correspondence" columns of the "JOURNAL OF GAS LIGHTING" that, when the first experiments were made at the Hastings works in regard to the trouble from naphthalene as affecting the district, a similar line of reasoning to that explained by Mr. Carpenter was followed. The condenser was of the water-tube type, and was made reversible, in order to keep it efficient; and having ascertained the average temperature in the various parts of the distribution, the outlet gas temperature was maintained in accordance therewith, which agrees with the author's statement that "the proper working temperature of the condenser would appear to be the lowest to which the gas is exposed in the distribution to the consumers." This system was in vogue for several years, without, I regret to say, satisfactory results—probably owing to the accumulation of naphthalene already existing in the canalization, which would be re-absorbed and deposited by the gas according to circumstances. Comparative quantitative tests for naphthalene on the lines suggested by Dr. H. G. Colman are now being made at Hastings; but I am sorry I cannot give results at the moment. I cannot help thinking, however, that a very small quantity per 100 cubic feet can, under some circumstances, cause trouble in distribution.

Mr. S. Y. SHOUBRIDGE (Lower Sydenham) said in these days, when the mind of the profession seemed to be wholly absorbed in the question of inclined retorts *versus* horizontal retorts, it was rather refreshing to have their attention directed to another part of their apparatus, which was by no means unimportant. It was singular that for many years nothing had been said at any of the meetings of the different Associations with regard to condensers, and yet, he supposed, it could not be imagined that they had attained perfection in connection with them. There were a great many varieties of condensers. As the members knew, in hardly two works were they alike. Of course, they could not all be the best; and he should think there was room for a good discussion on the merits of horizontal condensers as against vertical condensers. He was unfortunately old enough to remember a meeting of the British Association of Gas Managers, at which one of the old members got up in his place and thanked God for having given them wrought-iron condensers. Since that time, there had been little motion on the subject; but they were indebted to the author for bringing it to their notice again, especially in relation to the question of naphthalene. They were indebted to him particularly, and to Mr. Browne, for the most interesting and useful tables that accompanied the paper, giving data which they looked for in vain in the text-books, and which they had never before obtained. They would indeed find the figures very useful in future. The type of condenser described was by no means new. It varied in its construction somewhat. Of course, the principle was an old one which had been in use for many years—at any rate, for a considerable time. He agreed with the author that it was an excellent one; and he (Mr. Shoubridge) considered it by far the best. He thought the water-tube condensers were infinitely to be preferred to air condensers, and that they would see very few air condensers erected in future. He himself a few years ago erected at the works of which he had charge, a condenser very similar to the one shown; and prior to that time they were troubled occasionally—not very greatly, but occasionally—by stoppages of naphthalene in the condenser. It was an annular vertical air condenser; and, on putting in a water-tube condenser, with Mr. Carpenter's reversible arrangement, the difficulty was completely done away with. They had had no trouble with it since, nor had they had any trouble in the rest of the plant. They had before slight stoppages occasionally at the inlets of the gas-holders. Now they had none at all; but they did still get considerable trouble in the autumn in the district—in the services and mains. They were able in the three winter months to reduce the average temperature to 55°, and, during that time, to keep without any complaints at all. They had, in fact, no complaints in the winter; and this would rather confirm the author's contention that, if they could keep the temperature low enough, they would prevent the stoppages in the district. He might say that during the last three months they had been making daily tests for naphthalene; and the average result, during that period, had been a little over 8 grains per 100 cubic feet of gas—that was, about double what Mr. Carpenter had found with his arrangement. This proved, he thought, that it was not necessary to take out the whole of the naphthalene, and that it might be possible, if condensing could be maintained throughout the summer to the figure they had done it at in the winter, that they would be free through that period also. But, of course, this had as yet to be proved. Mr. Carpenter had not told them in his paper whether he had succeeded in preventing the naphthalene in the district; and he hoped, in his reply, he would do so. If he had not shown them an entirely novel condenser, he had given them a remarkable statement in Table C, which he (Mr. Shoubridge) believed was unique—anyway it was most astonishing. In it they saw that in ten years the quantity of clean naphthalene sold had increased from 20 tons to 107 tons; and it therefore certainly was time that some invention should be adopted to do away with so deplorable a state of things.

Mr. DOUGLAS H. HELPS (Redhill) also thought this question of naphthalene prevention in the district was of far greater importance than the question of the relative advantages of inclined and horizontal retorts; and if Mr. Carpenter had solved it, he had really done a most useful thing. Mr. Carpenter had made tests of the purified gas after it had passed the condensers—after they had been reversed; and the amount of naphthalene found was 1½ to 3½ grains. He believed Mr. Carpenter also stated that he could not correctly determine the amount of naphthalene in the unpurified gas, owing to the action of other impurities; but he should like to ask him whether he had been able to make an analysis so that, by comparing the amount in the gas before and after the passage through the condensers, he could tell exactly what it had been doing. In one of the tables was a calculation, from the amount of crystals taken out of the mains, of the amount of naphthalene that had been in the gas; and it varied in the first ten years from under 30 grains to over 60 grains per 100 cubic feet. This amount was far greater than was usually found in purified gas; and he should like Mr. Carpenter's opinion as to where the greater amount came from. Was it picked up in the works from old deposits? The amount also very greatly increased with the amount of gas made; and it would be interesting to know whether the condensing power was increased with the increase in the gas production.

Mr. T. GLOVER (Norwich) said he had been much interested in this water-tube condenser, and with the proposals Mr. Carpenter had made for the removal of the naphthalene. He would like to note first that Mr. Carpenter hoped for relief from naphthalene stoppages on the district by its removal at the condensers. They ought to note also that he did not hope by any means to retain the naphthalene in the gas, and keep it from depositing. He (Mr. Glover) thought this was the right starting-point. The natural question which presented itself was this, Was this the best form of apparatus for removing the naphthalene, or was there some other method that was better? He (Mr. Glover) thought this certainly marked a great step forward; and he wished to say that they ought to regard this condenser not only as a cooler, but as a scrubber. They had not been used to consider the condensers as scrubbers; but he thought it would be possible to regard them in that light as well as coolers. The condensers no doubt acted as scrubbers for the removal of certain vapours from the gas by the action of deposited oils on the water-tubes or on the cold surfaces of the condenser. In the reversible condenser, the scrubbing action was increased by suddenly chilling the gas at the moment the reversing action was made. In this way, some of the naphthalene was removed by these solvent oils or tars without going through the intermediate stage of crystallization. But Mr. Carpenter depended chiefly upon crystallization for the removal of the naphthalene; and this to his (Mr. Glover's) mind was the weakest part of the proposal. Mr. Carpenter first allowed the naphthalene to crystallize at the cool, or terminal, end of the condenser and then he applied solvents from the gas itself to remove these crystals. The question which presented itself to his (Mr. Glover's) mind—though he confessed this had some advantages, inasmuch as it used that which was in the gas itself to remove the crystals—was it better to allow the crystals first to form, then to remove them, or to deal with the vapour in the gas before the crystals were allowed to form. They could follow the sequence of ideas, and appreciate them. The line of reasoning that had occurred to Mr. Carpenter was this: He had a great deal of trouble with his condensers blocking at the terminal end; and he thought that, if he could make the terminal into the inlet and the inlet into the outlet alternately, the difficulty of the blocking of the condensers would be avoided. At the same time he evidently regarded the condenser as the best apparatus for removing the naphthalene. There were several questions one would like to ask Mr. Carpenter—for instance, if the 1½ to 3½ grains of naphthalene was an average test? He (Mr. Glover) fancied that, just before the reversing of the condensers, the gas was leaving them supersaturated; and therefore he should expect the quantity of naphthalene per 100 cubic feet to run up very rapidly just before the time of reversing. This was the only difficulty that presented itself to him, that it seemed imperfect at that point—that if the terminal end was allowed to get clogged with naphthalene just before it was reversed, gas must be leaving the condenser saturated. He thought they ought also to remember that it was not only a question of temperature, but of area upon which the crystals were to be deposited. Their distributing systems consisted of miles of mains laid underground, probably with an average temperature of 46°; and it took miles of mains (some of them of considerable size), the attenuated services, main tap, and the valve box of the wet meter to bring about the final deposits of naphthalene. So that he was afraid the condensers would have to be extended to a considerable degree—far beyond anything they had yet seen—if the final deposits of naphthalene were to be left there.

Mr. W. D. CHILD (Romford), invited by the President, said he had intended to keep his seat, for the reason that, although he had been conducting the manufacture of gas for the past 25 years, he had had no practical acquaintance with naphthalene either in the works or in the district. He did not know why this was. For some fifteen years, he was managing a very old works which necessitated the use of the best materials—South Yorkshire coal and that sort of thing; and many friends used to say: "You are a happy man to be free from the troubles of naphthalene. You may put it down to the coal you are using; but if the day comes when

you have to use Durham coal, you will form an undesirable acquaintance." He had had that acquaintance now for over ten years. He had during that time been using nothing but Durham coals of different qualities; and he was not troubled by naphthalene either on the works or in the district. He always worked his retorts at fairly high heats. He used open tubes; and before the condenser proper, he employed a straining-tube containing discs in which were fine perforations, and the gas was strained while hot. This might perhaps have something to do with the absence of naphthalene in other parts of the plant. But he could not say definitely that was so. He could, however, honestly state that he had had no trouble such as Mr. Carpenter had evidently experienced.

The PRESIDENT: What form of condenser do you use?

Mr. CHILD: An annular air condenser.

Mr. D. H. HELPS: Tar or liquor seal?

Mr. CHILD: No seal at all; I have an anti-dip.

Mr. T. MAY (Richmond): How long have you had this screen in use?

Mr. CHILD replied that the screens had been continuously in use for ten years. He had opened the tube at various times to see if there was any deposit; but he had never seen any. They were made slightly pitched so that the tar and all matters that were strained from the gas ran down the sides of the tube.

The PRESIDENT said before asking Mr. Carpenter to reply, he should like to add a few words on this matter. He thought the method adopted by Mr. Carpenter was an admirable one, as it got over a difficulty which he had. He did not mean by this it was a universal difficulty; but that it was a difficulty Mr. Carpenter had had. Most gas managers knew of condensers that had blocked up. They had heard of a bad one there; and the method adopted in connection with that condition of things was the one described. Some managers adopted the method of cleaning them out. Then, again, other condensers they knew of never stopped up; but as far as they could tell, the conditions of working were the same as in the works where the condensers did stop up. Presuming, for the sake of argument, the conditions to be the same, there must be some difference between the two condensers to cause an effect in one that was not caused in the other. This appeared to him to be a question of area, and in addition of temperature. It was hardly necessary to mention the question of temperature. It was, of course, understood in the argument that the temperature should be sufficiently low. Given the same temperature in both, why did one condenser get stopped up, and another not. There, he thought, the question of area came in. He would interpose here the remark that, though Mr. Carpenter's paper was one on condensers, he did not see that they could very well discuss the matter unless they considered it as a condenser in which he found naphthalene; and therefore the naphthalene point could not be eliminated from the discussion. If it was a case of area, then the method adopted by Mr. Carpenter to get over the obstruction (which was a serious one) was very ingenious. When he got no naphthalene at the inlet of his condenser, the temperature there was high. He got it when the temperature would allow of its deposition; and when he had so much there as to stop the flow of gas, he brought the gas to that end, and the result was obviously to soften the accumulated naphthalene sufficiently for it to run down. That it was in an almost solid condition, the method he adopted to get rid of it indicated. Now it came to the question, if they were going to use their condenser not only as a cooler, but as an eliminator of naphthalene among other things, but primarily naphthalene, that was the only thing that was worth any consideration. Then the question was whether, as Mr. Glover suggested, the condenser was the best form for accomplishing the object in view. If they expected in this to get a deposition of solids, then he would suggest that this was not the best form in which to get it. But perhaps it was not necessary to get it in the form of solids. As Mr. Glover had suggested, the naphthalene might be taken out before it became solid. The naphthalene was evidently absorbed by the lighter tars at the end of the condenser when the other conditions allowed of its remaining there. Undoubtedly it was absorbed by these tars, and ran away with them to a certain extent; but it also accumulated, and was not able to run away. Then it occurred to him that the whole of the question might be summed up in this: If they were to eliminate the naphthalene from the works, what he called time-contact was a most important factor. Given long enough in contact with suitable materials, the naphthalene would come out. But had they not been going all this time blindly using their condensers merely as condensers. When the temperature was reduced sufficiently—down to atmospheric temperature (they used various methods to do this, but no doubt the best method was by employing water)—they said condensing was finished, and they then went on to other things such as scrubbing. Now it occurred to him that, if this was the case, then they wanted to add another process to their manufacture of gas, which process was carried out in various ways with success—that was, by washing the gas—taking it out of the condenser before it had time to block it up, and then treat it for the naphthalene in an apparatus where it was probable it would be carried away and absorbed in the tar without becoming solid. Why did they want to go to oils to do this? Why did they want to purchase oils of various names and colours, if Mr. Carpenter found that he could get the naphthalene down to from 1½ to 3 grains with the material he found on the works. It was surely an indication that they had the materials there for doing it. Let them then take their light tars, and put them into such an apparatus as a Livesey washer, and give the tar an opportunity of coming into intimate contact with the gas. Then it seemed to him they would have got over the difficulty of the solid naphthalene, which was such a trouble to them. Give the gas time-contact with a suitable material, and they would get out that which had been a source of great trouble to them. These were the ideas that had occurred to him in reading the paper. Considering the time-contact there was in the district (and they were really still puzzled as to what did actually happen in the district), he did not think they gave the gas time in the works to do what it would do if they gave it longer.

Mr. CARPENTER, in reply, said that he fully appreciated Mr. Glover's remarks. If there was any gas engineer who had worked hard on the naphthalene question, and who knew the problem to be solved, it was Mr. Glover. He considered that the system his brother had worked out for the removal of naphthalene by washing the gas in the way he did, and the method (with which he had been associated) of distilling coal at low heats for the purpose of automatically making the solvents he required for the purpose, deserved the highest praise. The method which he (Mr. Carpenter) had described was the alternative way of doing it. He did not pretend for a moment it was the right way. But if it accomplished the object, it had its advantages. For one thing it was not necessary to handle (which in large works would be a serious thing) the volume of oils the use of which Mr. Glover suggested, for the purpose of washing out the surplus naphthalene. As he said, they were all agreed now upon the real point of the naphthalene difficulty—that was, that naphthalene must be regarded as an impurity which had to be removed from the gas. It had been truly said by Mr. Helps that it was a most serious impurity—far more serious to the consumer than all the sulphur he was likely to get. With regard to what Mr. Glover said about the gas being supersaturated with naphthalene when the last tubes were becoming coated, he might say that the last legs of the condenser—that was the two terminals of the horseshoe—were lagged with some 6 inches of composition, so that the cooling down to the final temperature at which the gas left the condenser was quite apart from the influence of the atmosphere—that was to say, it was cooled down by tubes—not naked, but coated with a certain amount of naphthalene. Wherever that might be, and whatever the amount of naphthalene on the tubes, the interchange of heat must go through the coating of naphthalene; otherwise the last vertical set of small tubes could not do the work that it did. Another point that Mr. Glover put was with reference to the test for naphthalene. The tests of the naphthalene were average ones. They made a great many at Bankside; and these were the average tests within the limits given in the paper. Mr. Helps asked a question, which was a very important one, as to whether they had succeeded in making an estimation of the amount of naphthalene on the inlet and the outlet of the condenser. Naturally, this was the very thing he was most anxious to do, because it would have enabled him directly—in the same manner as they could trace the action of a purifier—to trace the action of the condenser on the naphthalene from day to day and from hour to hour. Unfortunately, he could not get the tests to work at all; they appeared to be absolutely unreliable on the foul gas—whether it was in the inlet of the condenser or the outlet, quite apart from any question of temperature. He was really without any information other than the tests in the paper. With regard to Mr. Shoubridge's remark, he made no claim (and he thought he had made this perfectly clear) for any novelty in the condenser as a water-tube one. Water cooling, as he pointed out in the paper, was in use in 1840 at the Bankside works, in the very vertical condenser with which the first experiments were made. But what he did claim was to have done something more than use the condenser as a cooler of gas. By means of the reversing arrangement, they had made it an efficient extractor of naphthalene also. He thought this was a novelty; he did not think it had been done before.

Mr. SHOUBRIDGE: I think not.

Mr. CARPENTER (proceeding) said, with regard to naphthalene elimination, it was perfectly true what Mr. Botley had said in his communication to the President; one could not expect changes at once. Bearing on this, he (Mr. Carpenter) might tell the members what they had to do with some of the mains leading out of the Rotherhithe works last year. In the paper, he had given figures of the amount of naphthalene actually collected and sold from the mains leading from the purifiers at Vauxhall to the station meters at Kennington Lane. That was one case; and at Rotherhithe, they had another case. On the works at Rotherhithe were the station meters and holders; and the gas was stored there, and distributed in the usual way. The last two or three years they had been in a little difficulty about getting the full supply, and part of this he believed—in fact, he knew now—was due to naphthalene in some of the district mains. Last year they opened up three mains; and for something under half-a-mile on each, they cleared them out of naphthalene. Altogether they had about fifteen cartloads of naphthalene out of these three district mains. He should like to add another point; and it was this. Naphthalene crystals often collected where a service was tapped into the main. Now something like 10 grains of naphthalene was quite sufficient to stop the current of gas passing through a service. At this rate, a ton of naphthalene would stop 1,500,000 services. When they remembered this fact, he thought they would see that it was impossible, with these quantities of

naphthalene they had taken out of their mains, to look for rapid and immediate results. When a large amount of naphthalene was sent into the mains, and it was deposited there, it took time before it was vaporized and consumed in the burners. But after all, all this might be very well, but the vital point was, what was the effect in the district? Unfortunately, as he explained in his paper, they only had these condensers in operation at the Bankside works; and it was not possible (the works were the smallest they had, and only supplementary ones) to separate the gas from that supplied by other stations. What he could say as an absolute fact was that, whereas they used to have to clear out their works' mains every Sunday, all the other conditions remaining the same, they had not had to open them since, except for inspection to see whether there was anything there, and they had found nothing at all. Then, in regard to the question about the amount of naphthalene taken from the Vauxhall mains, it was a progressive amount—not only in quantity, but in grains per 100 cubic feet. There were air condensers there; but he thought the main reason was this—that, although the output of gas was extended, the condensing power was not. He might say that for many years they had been working under the restrictions of the Gas Referees, which were, as the members knew, extremely onerous. The Company got into the habit of doing with as little condensing power as possible, so that they might not take anything out of the gas which would be likely to affect the illuminating power in any way. Now they were fortunately free to a large extent from these restrictions; and, having a free hand in the matter, they could make their experiments as they wished. Although they were cooling the gas down to much lower temperatures than before, he was bound to say he did not think it had affected the illuminating power. This was a matter that was not of so much interest to the Company now; but he could understand that it was to some other members of the Association.

The PRESIDENT proposed a hearty vote of thanks to Mr. Carpenter for his paper. He thought the author had helped them forward considerably on this question, and was certainly doing good work to add further to the light on the subject.

Mr. SHOUBRIDGE seconded the motion, which was carried by acclamation.

Mr. CARPENTER said he thanked the members sincerely for their hearty vote of thanks. He said he would mention one thing which bore upon the subject and upon a point raised by the President in his address. Mr. Price spoke of the disadvantage of sending lads as pupils to large works. He (Mr. Carpenter) heartily endorsed that. Where a boy would really learn was not in a large works, but in a small one. They might ask, what this had to do with the paper. He said it because had it not been for having a small works like those at Bankside, it would have been impossible to make the experiments they had made with the thoroughness or completeness they had been able to do there. The output was about 2 million cubic feet per day; and with this comparatively small quantity, they had been able to pass the whole of the gas through this treatment. Therefore they could speak, so far as these works were concerned, positively about the results.

In the evening, the members dined together, with the President in the chair. A most enjoyable time was passed.

TEMPERATURES OF THE CYLINDER WALL OF A 400-HORSE POWER DOUBLE-ACTING GAS-ENGINE.

By E. KÖRTING.

Translation from the "Zeitschrift des Vereines Deutscher Ingenieure," Jan. 25 (Summarized).

The necessity of utilizing large gas-engines for blast-furnace work carries with it certain conditions affecting their construction which do not arise with small motors. Besides the rapid and complete combustion of a large volume of the charge, an equally important point to be considered is the expansion of the motor cylinder itself in the direction of its axis, compared with the expansion of the surrounding cylindrical water-jacket. The two are usually cast in one piece, or closely joined to each other; and this method of construction, if not essential in a two-cycle engine, is highly desirable, because great solidity is required in this class of motor.

To develop the large powers needed in blast-furnace work, it is almost a necessity to have two-cycle engines, single or double acting. The weight and dimensions of the several parts become too large if the four-cycle is carried out in a single cylinder; and the size and complication of the motor are serious drawbacks if the unit of power is obtained by combining four separate four-cycle engines. Both methods of construction, therefore, can only be considered as temporary expedients, until efficient two-cycle engines, running steadily and with the requisite regularity, come into the market.

The writer desired to obtain a clearer view of the expansion of the cast-iron cylinder in two-cycle engines, and to know whether, if the parts are carefully combined, the difficulty occasionally met with in single-acting two-cycle engines—namely, the fracture of the water-jacket—can be wholly avoided in double-acting motors. With this object, he carried out careful tests of the temperatures of the cylinder of a 400-horse-power double-acting two-cycle engine. The diameter of the cylinder was about 21½ inches; and it was about 5 feet long. To take the temperatures, holes were drilled in three places in the cast-iron wall of the water-jacket, and continued through half the thickness of the inner cylinder wall; and small tubes were then inserted, passing through the water-jacket and water-space into the cylinder wall. The inside of these tubes was filled with mercury, into which thermometers were plunged. By these means, the temperatures of the inner cylinder walls could be read off, and this for different loads on the engine.

One of the holes was bored through the ports of the exhaust passage, as it seemed possible the ports, which are not directly cooled, might become so hot as to injure them, as had already been noticed in single-acting two-cycle engines. In the engine tested, the piston is cooled by water circulating inside it; and this helps considerably to cool the ports, which the piston overruns and protects during nine-tenths of the stroke. No attempt was made to investigate the temperature of the walls in the valve-chest or in the combustion or compression chamber, in which the highest temperature prevails, because in the engine tested this chamber was separate from, and bolted to, the cylinder, and its iron walls could expand freely. In most two-cycle engines, the combustion chamber is inside the cylinder; and this greatly influences the total longitudinal expansion of the latter. The results of the experiments are summed up in a table of the temperatures of the inner cylinder walls.

To make it intelligible, we must remember that the tests were made on a double-acting horizontal engine with a long piston—about half the length of the cylinder—giving an explosion on each side of the piston (one explosion) per stroke. At the end of each stroke, the piston uncovers ports in the centre and round the circumference of the cylinder. There are no regular exhaust-valves. Hole B, near the dead-centre, is close to one end of the cylinder, at the beginning of the explosion stroke. Hole C, near the centre of the cylinder, was at the middle of the explosion stroke of the motor. Here the temperatures and pressures of combustion in the cylinder are lower than at B. Hole D was at the end of each motor stroke, where the hot gases pass through the numerous exhaust-ports in the cylinder wall from each side of the piston. Here we should expect a higher temperature as the gases are discharged near these holes at every stroke, at each end of the piston, and the time of exposure of these holes to the gases is much longer than in the case of B or C. The cast-iron cylinder wall was water-jacketed in the usual way, the cold water going in at each end, and passing out at the centre. The wall was about 1¾ inches thick, and the diameter of the cylinder about 21½ inches. The temperature holes were drilled two-thirds of the way into the walls, leaving a thickness of one-third of the metal; the centre of the bulb being about half-way through it. The temperature of the cylinder walls was also affected by the water-cooled piston.

Temperatures (Degrees Fahrenheit) of Cylinder Wall of a 400-Horse Power Single-Cylinder Horizontal Double-Acting Gas-Engine.

Load on Engine.	Temperature of Cylinder Wall.				Temperature of Cooling Water of Cylinder Jacket.		
	At B.*	At C.†	Difference between B and C.	At D.‡	In.	Out.	Rise.
Quarter .	167·0	134·5	32·5	313	68	91·5	23·5
Half . .	181·5	147·5	34·0	320	68	97·0	29·0
Full . .	201·0	146·0	55·0	338	68	100·0	32·0

* Beginning of stroke, dead-point centre. † Near middle of stroke. ‡ End of stroke at centre of exhaust-ports.

This table shows how the heat of the walls varies with variations of the heat inside the cylinder; and, further, it must be noted that the temperature of the cylinder wall close to the combustion chamber is considerably higher than that of the wall nearer the centre, though the hole B, being placed at the dead-point, is, during at least one-quarter of the time, covered by the cooled piston. We may thence conclude that, as the temperature of the compression space outside the cylinder is much hotter than at point B, and its surface is never cooled from within the cylinder, therefore the temperature of the walls in this compression chamber will also be much higher than the cylinder wall at B. If the shape of the compression chamber does not allow of its free expansion, serious results may follow.

It is important to note that the temperature of the exhaust-ports at D does not exceed 170°C. (338° Fahr.). On account of the short length of the ports, and their diagonal position, their expansion against the surrounding water-jacket cannot have an injurious effect on the cylinder as a whole. The heat here is not great enough to carbonize the lubricating mineral oils.

Herr Körting proceeds to give some figures to calculate the longitudinal expansion of the cylinder walls as against those of the water-jacket, and proves that this expansion does not exceed the allowable limits of elasticity. Therefore, in the engine tested, there was no fear it would work unsteadily, on account of variations in the expansion of the cast-iron cylinder and water-

jacket. But if the temperatures of the combustion space enclosed within the cylinder were too high, and the exhaust-ports were not cooled by an internally-cooled piston, difficulties would certainly arise. In that case, the jacket ought to be elastic; but this would be difficult to obtain in an engine of sufficiently strong construction to bear the high pressures now usual. Similar considerations must also influence the shape of the combustion chamber; for if not designed with great care, the cast-iron water-jacket may crack, as has frequently happened in large four-cycle engines when running.

BURNING-OUT RETORTS.

Herr Th. Hahn, of the Kötzschenbroda (Saxony) Gas-Works, has tried a process of burning-out retorts advocated by Herr Schmitt, of Pirmasen; but he found it desirable to dispense with the small boiler used in that process, and also to protect the pipes before the burning-out.

This object, he attained as follows: Water (instead of steam) and air are introduced from behind into the retorts by a single hole, 2 inches wide. The water runs through an opening 0·08 inch wide at A (fig. 1) on to a hollowed-out brick placed under the opening. In front, in the mouth of the retort, is a sight-hole.

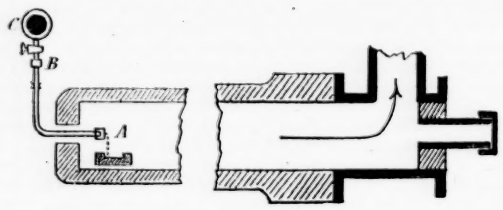


FIG. 1.

Each furnace has three outlets for the water supply, with a ¾-inch outlet tap. The connection at B is removable, and can be screwed in as required for each retort. The main supply C can be connected with a high-pressure service, as the inflow can be observed from the sight-hole, and regulated accordingly. The process has, according to Herr Hahn, worked excellently so far.

With reference to Herr Hahn's suggestion, Herr A. Roedel, of Worms, contends that the above process is not fundamentally new; and he gives the following particulars of his own patent cylinder for the removal of retort carbon: He says that water was introduced merely to protect the pipe R (fig. 2) from injury through getting red-hot, and not with the object of loosening the carbon from the retort. For burning-out the carbon, the vessel S and the bricks C were first put in the retort—the former to hold

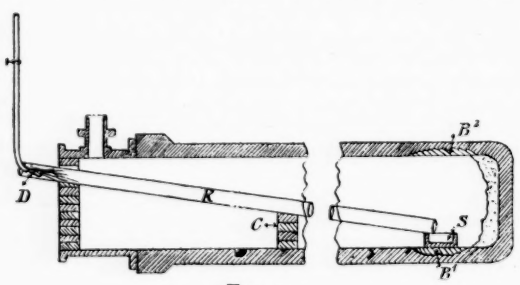


FIG. 2.

the water for evaporation, the latter as a support for the pipe R, so that it should not be bent under the influence of heat. The nozzle D, which had three small holes, was in the middle of the pipe R—not to cool it, but to act chiefly as an injector, to convey air to the bottom of the retort. The vessel S was placed in the retort as a matter of precaution—merely to evaporate the small quantity of water which would not be wholly evaporated in the pipe R, which was about 8 feet long and 6 inches in its internal diameter.

It was soon apparent that this process did not answer, and that the entrance of water must be prevented under all conditions. The vessel S heated very quickly in the retort; and when the water was admitted, it was liable to crack, so that the water ran through it, and then evaporated on the floor of the retort. It was noticed that, owing to the steam thus formed, the glazing came away from the inside of the retort near the points of evaporation B^1 and B^2. A still greater evil was that, at the places where the retort had lost its glazing, the carbon forming afresh worked itself so deeply in that it became quite impossible to remove it.

The observations induced Herr Roedel to enclose the water necessary for cooling the pipe in a double-cased cylinder, so that steam could not occur in the retort, and the carbon was then loosened solely by dry or cold air. This latest patented apparatus has, he states, been so improved and perfected that even the heaviest deposit of carbon is removed from the retort in from four to six hours, without the least injury.

EXPLOSIVE LIMITS OF COMBUSTIBLE GASES.

By Dr. P. EITNER, of Carlsruhe.

[Abstract Translation of a Series of Five Articles in Recent Numbers of the "Journal für Gasbeleuchtung."]

Many researches have been made on the phenomena of gas flames; nevertheless they have been but imperfectly elucidated, owing to the complexity of the reactions involved, and the great speed at which the reactions occur. This remark applies both to ordinary gas-flames and to explosive gaseous mixtures. The investigation by experiment of the problems involved must necessarily commence with the simplest conditions; and therefore the flames of simple gases must be investigated before those of coal gas and other complex mixtures.

The phenomena which attend the combustion of hydrogen and carbonic oxide are comparatively simple, because these gases each yield substantially only one product of combustion—viz., water vapour or carbonic acid. But with hydrocarbons, for instance, it is otherwise; their combustion yields a whole series of products, which, at the high temperature, mutually affect one another. Most involved of all are the phenomena of the flames of coal gas and of gases resulting from the combustion of ordinary fuels and illuminants. Mixtures of gases result, which are constantly changing in composition as the combustion progresses. Hence a study of these flames must be preceded by knowledge of the phenomena which occur in the case of the simple gases.

If a stream of gas issues from an orifice into the air, a gas-jet is produced, in the circumscribing zone of which continuous admixture of gas and air takes place, which admixture penetrates more deeply the farther the gas-jet advances. This applies to the cold gas as well as to burning gas. It is therefore clear that in burning-gas jets the chemical composition of the mixture changes from point to point, and is only constant at one and the same spot. But the conditions are different if the requisite quantity of air or oxygen for combustion is mixed thoroughly with the gas prior to its combustion. The mixture can then be burnt in a closed space. Combustion, in the nature of an explosion, then proceeds rapidly throughout the whole mass of gas, which is under uniform conditions that can be chosen at will. An explosion experiment reproduces the phenomena which occur at some particular point in a burning gas-jet, and so renders them accessible for study.

Reference must first be made, however, to the conditions which are generally applicable to the combustion of gases. When an inflammable mixture of gas and air is rapidly raised to increasingly higher temperatures, a very sudden union of the combustible portion of the gas with the oxygen occurs at a definite limit of temperature, which is called the temperature of ignition. The gas present burns, and liberates a determined amount of heat, which is the heat of combustion. This heat imparts a high temperature in the first place to the products of combustion; and this temperature is known as the temperature of combustion. If heat is transferred to portions of gas adjacent to the heated zone, so that they are raised to the temperature of ignition, these portions also ignite, and the ignition is propagated. But transference of heat to adjacent layers of gas occupies time; and consequently ignition advances at a certain measurable rate of velocity, which is known as the "rate of propagation" of the explosion. Finally, if the explosive combustion occurs in a closed vessel, the gases, expanded by the heat of combustion, exert pressure on the walls of the vessel while the combustion lasts. This pressure of the explosion can be regarded as a measure of the violence of the explosion, if ignition has taken place almost simultaneously throughout the whole mass of the gas. Bunsen designates the maximum pressure thus produced as the "explosiveness" of the gaseous mixture. But explosion only occurs in a mixture of gas and air if the quantity of combustible gas falls within certain limits dependent on the nature of the constituents and other conditions. These limits are known as the "explosion limits" of the gas in question. A knowledge of these limits is the basis of all researches on explosions; hence they must first be dealt with.

EXPLOSION LIMITS.

The explosion limits of a gaseous mixture are understood to mean the percentages of combustible gas in the mixture with which an explosive combustion can still occur, and with which explosiveness ceases as soon as the gas which is present in the mixture in excess is augmented by a little. The lower explosion limit signifies the least quantity of combustible gas which makes the mixture explosive; and the upper explosion limit signifies the maximum of combustible gas which the mixture can contain without losing explosiveness. The interval between the two limits is termed the field or range of explosion.

The literature of the subject—which Dr. Eitner reviews much more fully than the following summary suggests—commences with the classic researches of Davy on "Flame" ("Philosophical Transactions," 1817, p. 59), in which he showed that detonating gas ceased to explode when certain proportions of gases had been added to it. Similar researches were made by Humboldt and Gay Lussac ("Annalen der Physik," 20, p. 49), Henry ("Annals of Philosophy," 25, p. 426), Turner ("Edinburgh Philosophical Journal," 12, p. 311), and Regnault and Reiset

("Ann. Chem. und Pharm.," 59, p. 208). Bunsen dealt with the subject in his "Gasometrische Methoden" (second edition, p. 336). Frankland first determined explosion limits for a mixture of coal gas and air by researches on London coal gas, as reported in his "Experimental Researches," p. 536. The influence of the strength of the spark by which an explosive mixture is fired was dealt with by Herwig in 1873 ("Pogg. Ann.," 148, p. 44); while E. V. Meyer, in the course of his researches on the incomplete combustion of gases and gaseous mixtures, determined the upper limits of explosion of mixtures of hydrocarbons and oxygen ("Journ. für Prakt. Chem.," 10, pp. 237 and 330).

In 1875, Mallard published the results of some determinations of the rate of propagation of combustion in explosive gaseous mixtures; and, by extrapolation, the compositions could be deduced with which that rate becomes *nil*. These compositions would correspond to the explosion limits of the mixture in question. By this means, the explosion limits could be indirectly determined ("Annales des Mines," 1875, p. 355). Then A. Wagner made researches, especially with reference to the influence of the method of ignition on the results ("Bayer. Industrie und Gewerbeblatt," 1876, p. 186). Lehmann and Wüllner investigated the special case of mixtures of marsh gas, or fire-damp, and air ("Ber. d. preuss. Schlagwetterkommission," 1886, III., p. 193), and Broockmann, in 1889, dealt with the same question. In 1890, Bunte and Roszkowski made researches on the "Effect of Temperature on the Limits of Explosion of Combustible Gaseous Mixtures" ("Jour. fur Gasbeleuchtung," 1890, pp. 491, 524, 535, and 553). Then F. Clowes determined the limits of explosion of some mixtures when ignited by flame.* Le Chatelier investigated the limits of explosion for mixtures of acetylene ("Compt. Rend.," 121, p. 1144) and F. Emich made some observations on the length of spark required for the ignition of diluted detonating gas. Recently, Le Chatelier has published a method of determining the limits of inflammability and shown that a simple numerical relation subsists between the limits of explosion of single gases and those of their mixtures ("Annales des Mines, series 8, 19, p. 388). He has further, in conjunction with Boudouard, worked on the effect of pressure, temperature, and size of the containing vessel on the results ("Compt. Rend.," 1898, pp. 1344 and 1510). And recently, K. Kubierschky has described a method of determining the limits of explosion for mixtures of air with combustible vapours and mists, and given the results for a number of the higher-boiling hydrocarbons ("Zeits. f. Angew. Chem.," 1901, p. 129.) Finally, S. Tanatar has followed up E. v. Meyer's work on the incomplete combustion of mixtures.

Aim and Division of the Work.

Though the results obtained by investigators show many good instances of agreement, and it might be concluded therefrom that the limits of explosion are determinate constants dependent on the nature of the gas, there are nevertheless many considerable deviations which demand elucidation. In order to provide a sound basis for researches on the alteration of the range of explosion by inert gases, and for theoretical observations on the dependence of the limits of explosion on the physical and chemical properties of the gaseous mixture, the existing material was, in the first place, verified, and as much as possible amplified. The investigation was at first limited to the study of explosions of mixtures of combustible gases and vapours with air, on account of their great practical importance. The work divided itself naturally into three sections, of which the first comprised experiments on such explosions, the second experiments on the effect of different inert gases on the range of explosion, and the third a theoretical treatment of the results obtained.

The first section comprises, firstly, a description of the apparatus and methods used, and, secondly, the results obtained, and a comparison of them with those of former investigators. The second section includes the effect of carbonic acid (when it replaces atmospheric oxygen) on the range of the explosion field, and similarly that of aqueous vapour. The third section comprises the mathematical expression of the results of researches on the limits of explosion, the deduction of certain constants, and a discussion of the rate of propagation of combustion. The author was assisted greatly in the experimental work by Drs. Trautwein and Bucerius.

Section I.†

Explosion of Combustible Gases and Vapours with Atmospheric Air.—Before starting the experiments, it was necessary to come to a decision as to the shape and size of the vessel to be used for the explosions, and also as to the mode of ignition. Though the spherical shape, with ignition at the centre, seemed best adapted to ensure complete combustion, the course of the combustion could be better observed in tubes, which also facilitated the measurement of changes in the volume of the gas. On the other hand, the influence of cooling action from the cold walls is more to be feared in the case of tubes than with spherical vessels. But it would anyhow be almost impossible to exclude this influence entirely. The effect of the cooling action of the walls is, however, very marked. For instance, it was found that, under otherwise similar conditions, the mixture of hydrogen and air, in a spherical vessel of 1 litre capacity, had limits of explosion as follows: Lower, 8·7; upper, 75·5; while in a Bunte burette (tube) of 110 c.c. capacity, the limits were: Lower, 9·45; upper, 66·4. The size and shape of the vessel therefore made a difference of 0·75 in the lower, and of 9·1 in the upper limit. In the case of hydrogen, therefore, the cooling effect of the walls of the vessel is very marked, especially at the upper limit; but since the conductibility of hydrogen is about seven times that of the ordinary diatomic gases, this effect is not surprising. Consequently, in mixtures containing much hydrogen, the loss of heat through conduction will be specially great.

It will be seen later that the size of the vessel also affects the results very considerably in the case of acetylene; while in the cases of other gases, it has comparatively small effect. Whether the gases are ignited by electric spark in a closed vessel, or by a flame in an open vessel, alters the results; and considerable differences occur with flame ignition according to whether it is from the top or bottom of the vessel. F. Clowes has already called attention to this circumstance; and the results obtained by the author fully substantiate his earlier ones.* In an open cyclinder, $2\frac{7}{8}$ inches wide, the ignition of the gases by a small bunsen flame, first from the upper, and then from the lower end, gave the following results for the lower explosion limit:—

Mixture of Air and	Hydrogen,	Carbonic Oxide,	Water Gas,	Marsh Gas,	Ethylene,
Ignition from above . . .	8·5	—	12·3	6·3	3·4
,, ,, below . . .	4 5	14·4	6·3	5·5	3·4

The differences are in some cases considerable. When ignition is performed from below, the currents of the adjacent strata of gas are more restricted by the walls of the vessel; while the flame takes the same direction as the heat conveyed by the mechanical movement of the strata of gas. Both circumstances favour the support of combustion, or the extension of the range of explosibility. But the following comparison of results obtained by spark ignition in the Bunte burette with those of flame ignition in the open $2\frac{7}{8}$-inch cylinder, show how much the results of explosion tests are generally dependent on the experimental conditions:—

Mixture of Air and		Hydrogen,	Water Gas,	Marsh Gas,	Ethylene,
Lower Limit	Burette . .	9·45	12·40	6·10	4·10
	Cylinder . .	4·50	6·30	5·45	3·40
Upper Limit	Burette . .	66·40	66·75	12·80	14·60
	Cylinder . .	—	71·50	13·50	20·55

Trials carried out over mercury with combustible vapours, under similar conditions to the foregoing, showed equally clearly the influence of the experimental conditions on the limits. Thus, for the lower limit, the figures obtained were with:

Mixtures of Air and Vapour of	Benzene,	Pentane,	Benzoline,	Ether,
In burette	2·4	2·15	2·4	2·8
,, cylinder	1·4	1·30	1·1	1·6

In these cases, the differences, although small absolutely, are relatively very great.

The pressure of the gaseous mixture may also greatly affect the results; but its effect varies much for different gases. With hydrogen, for instance, the same lower limit was found at all pressures from ½ to 4 atmospheres; but with carbonic oxide, the increase of pressure caused some considerable extension of the range of explosibility. The experiments on this point are not, however, yet brought to a close. Thus, it is evident that absolute values cannot be obtained for the explosion limits. Nevertheless, if the conditions are known with precision, the values found have a certain general significance. These researches fully established the fact that, under like conditions, the same values were constantly obtained for the explosion limits. Thus, though the values found under a particular set of conditions were not absolute, nevertheless they were strictly comparable. The object of the author's researches was, in the first place, to obtain such comparable values; hence it was necessary to make all the tests in the same explosion vessel, and with the same method of ignition. Flame ignition was undesirable, because of the currents of gas set up, and because, in order to measure the contraction, it was necessary to make the tests in a closed vessel. An incandescent platinum wire had been found to give unsatisfactory results with mixtures containing marsh gas. Hence the spark from an induction coil was used; and a Bunte burette, of 110 c.c. capacity and 19 mm. wide, was chosen as the explosion vessel. The tests were made, where possible, over water; but in the case of readily soluble gases or vapours, over mercury.

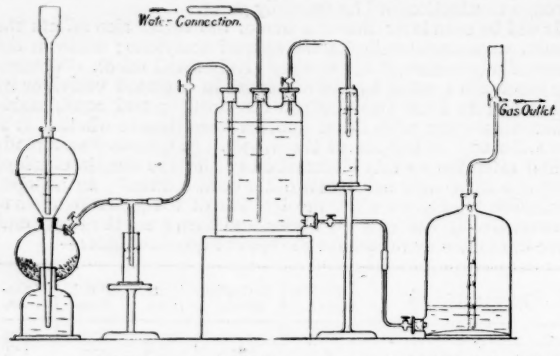
Production and Storage of the Gases.—The gases required were made by well-proved methods, each mentioned under the head of the particular series of tests. Special care was given to the highest possible degree of purity, as well as freedom from air. Generally, air was first expelled from all the vessels used in generating the gas, by carbonic acid, which was subsequently absorbed by a solution of caustic potash. Small quantities of gas were collected and stored in litre cylinders over mercury; but larger stocks were kept in 10 to 15 litre glass flasks over water. In order to avoid contamination of the gas by air from

* "Journal," Vol. LXVI., p. 1343, and Vol. LXVII., p. 1315.

† The first only of the three sections is dealt with in the present communication.

* See "Journal," Vol. LXVII., p. 1315.

the water, a method that had been recommended by Bunte and Roskowski was employed. The apparatus required is shown in the annexed figure. The water of the town supply contains only traces of air, and is led by flexible tubing directly into the pressure-vessel of the gasholder, which is charged with carbonic acid. Here it becomes saturated with carbonic acid, and does not come again into contact with the air. From the



pressure-vessel, it passes into the gas-storage bottle, into which a little solution of caustic potash is introduced by a tap funnel. This solution absorbs the carbonic acid, so that the gas only comes in contact with water which is free from air and carbonic acid, and may be kept uncontaminated for a long time. The apparatus used in special cases will be mentioned later.

Carrying out the Tests.—The constituents of the gaseous mixture to be tested were introduced into the burette and brought to atmospheric pressure in the ordinary way. After reading the volume, and agitation, the mixture was ignited. As a rule, the explosion could be followed directly with the eye. But in order to be sure whether it was complete, and whether the mixture contained the intended proportion of combustible gas, the contraction and the carbonic acid (if any) formed were measured. The combustion was considered to be an explosion only when the passage of the flame through the whole length of the burette could be observed, or when the contraction corresponded to complete combustion. As small quantities of gas are always burnt in the immediate vicinity of the spark, a gaseous mixture which had not ignited at the first passage of the spark was not used further.

A series of about ten tests was made for determining each explosion limit. The composition of an explosive, and that of a non-explosive, mixture were first ascertained; and then the proportions of admixture were systematically altered until the explosive limit was reached from both directions with an accuracy of one-tenth per cent. Actually, about 2000 separate tests were made in the course of the research. Pressure and temperature were observed, and as the gases were always saturated with aqueous vapour, it was easy to calculate the volume of water vapour present. This water vapour takes no part in the combustion, but behaves as an inert gas added to the mixture, and as such must be taken account of in any exact treatment of the experimental results. The temperature and proportion of aqueous vapour present have therefore been given in the tables of results. The ratio of constituent gases in a mixture is independent of the water vapour present; but the absolute quantity of the gases in the mixture is not so. Therefore, in calculations, such as that of the temperature of combustion, in which the absolute quantity comes into account, the volumes of the dry gases must be introduced, in addition to the volume of water vapour which has to be dealt with separately. If V_m is the volume of moist gas, and V_d the volume of dry gas, and v the volume of water vapour in 100 parts of the mixture, then

$$V_d = V_m \times \frac{100 - v}{100}$$

(To be continued.)

Acetylene for Railway Carriage Lighting.—The Paris, Lyons, and Mediterranean Railway Company, who have had acetylene supply stations at Lieusant, Cesson, and Bois-le-Roi since 1900, have now provided an installation at their Bercy Station, Paris. It comprises three generators on the Pintsch system, each for 8800 cubic feet of gas per 24 hours.

Petroleum Institute Lectures.—Reference has already been made in the "JOURNAL" to the lectures arranged for delivery at the Petroleum Institute, in Bevis Marks, E.C., of which Dr. Dvorkovitz is Principal. Last Friday, he gave the first of a course on the "Origin of Petroleum;" and the succeeding lectures will be delivered on Wednesdays and Fridays during the present and next month. The valuable services of Professor Vivian B. Lewes, F.I.C., F.C.S., have been secured for three afternoon lectures on "Mineral Oil as an Illuminant." The first was given yesterday, when Professor Lewes sketched the history of mineral oil, dealt with the photometric value and also the danger of oil-lamps, and discussed the air-vitiating properties of oil lighting as compared with other methods of illumination. The second lecture will be delivered on the 24th inst., and will be devoted to carburetted water gas and air gas; and the third on the 7th prox., when the value of oil for gas making and as a fuel for incandescent gas lighting will be considered.

STANDARD SPECIFICATION FOR SUPPLYING THE STRUCTURAL IRONWORK OF GASHOLDERS.

Drawn up in 1901, conjointly by the German Association of Gas and Water Engineers and the Union of German Manufacturers of Gasholders.

Size.

The size of the gasholder is specified according to the available geometrical capacity of the bell in its highest position, neglecting the curvature of the roof, the hollow space in the cups and a horizontal strip nearly 4 inches (0·1 metre) high at the bottom curb of the outer lift of the bell—viz., according to the following calculation:—

(*a*) For single lift gasholders:

$$J = \frac{D_1^2 \pi}{4}(H_1 - h_0)$$

(*b*) For two-lift telescopic gasholders:

$$J = \frac{D_1^2 \pi}{4} H_1 + \frac{D_2^2 \pi}{4}(H_2 - T_1 - h_0)$$

(*c*) For three-lift telescopic gasholders:

$$J = \frac{D_1^2 \pi}{4} H_1 + \frac{D_2^2 \pi}{4}(H_2 - T_1) + \frac{D_3^2 \pi}{4}(H_3 - T_2 - h_0$$

In which:—

J = Capacity of the gasholder, in cubic metres;

D_1 = Diameter of the inner lift of the bell, measured between the inner surfaces of the side sheets, in metres.

D_2 & D_3 = Diameters in metres of the second and third lifts of the bell respectively.

H, H_1, H_2, and H_3 = Heights of the bell or several lifts respectively, measured in metres from the lower surface of the bottom ring up to the upper surface of the cup-sheet, or to the edge of the angle-ring respectively.

h_0 = 0·1 metre (nearly 4 inches).

T_1 and T_2 = Depths of the cups, measured in metres from the rim of cup to the lower surface of the bottom of cup.

Statical Calculation.

(*a*) The statical calculation of the guide-framing and of the framework of the bell, including the framework of the crown, is based on a maximum wind pressure of 200 kilos. per square metre (41 lbs. per square foot) on the surface, struck normally by the wind acting in a horizontal direction, which surface, is to be considered equal to 0·57 of the total projected area of the side walls; assuming at the same time a one-sided load of snow of 40 kilos. per square metre (8·2 lbs. per square foot) on the half of the roof opposite to that struck by the wind.

(*b*) The thickness of the walls of an iron tank is to be calculated according to the following formula:—

$$\delta = \frac{D\,H\,\gamma}{2 \times 100\,\phi\,s}$$

In which—

δ = Thickness of the sheeting of which the walls are made, in centimetres.

D = Interior diameter of the tank, in metres.

H = Height in metres measured from the upper edge of the tank to the lower edge of the ring of plates which is to be calculated.

γ = Weight of 1 cubic metre of confining liquid (water) in kilos. per cubic metre (water = 1000).

ϕ = A coefficient giving the ratio of strength between the sheeting at the pitch-lines of rivets and the solid sheeting. For double-row riveting ϕ = 0·75; for single-row riveting, ϕ = 0·6.

s = Permissible tensional strain of the material for sheeting, in kilos. per square centimetre (see "Material").

The thickness of sheeting, is to be taken at the round number of the next ½ mm. above the result given by the formula. In cases where the thickness of sheeting is less than 10 mm., ½ mm. is to be added. Sheets of less than 5 mm. thickness should not be used for the side plates of the tanks of gasholders.

(*c*) The angle-ring or curb of the bell of gasholders is to be made according to the following formula:—

$$Q = \frac{R D_1 (\gamma - \gamma_1) \cos \alpha}{4\,s}$$

In which—

Q = Cross-section of the angle-ring, in square centimetres.

α = Angle of inclination of the curb-sheets of the roof towards the horizontal. To facilitate the calculation, cos α is put = 1.

R = Radius in metres of the curvature of the roof of the bell.

D_1 = Diameter of the bell, in metres.

γ = Weight in kilos. of 1 square metre horizontal projection of the bell of the gasholder floating in its highest position—that is, the weight of the iron parts together with the water in the cups divided by the cross-section of the lower lift of the bell.

γ_1 = Weight in kilos. of 1 square metre horizontal projection of the roof structure—that is, the weights of the sheeting of the roof and of the framing of the roof divided by the cross-section of the upper lift of the bell.

s = Permissible tensional strain of the material, in kilos. per square centimetre (see "Material").

(*d*) The thicknesses of material, which are given under "Dimensions" for the sheets of the roof, sides, and cups are an ample allowance; and it is not necessary to prove them by statical calculation.

Material.

Homogeneous iron is to be used generally, which answers the normal requirements in connection with the supply of structural ironwork for bridges and high structures, which have been worked out by the Union of German Associations of Architects and Engineers, the Association of German Engineers, and the Association of German Iron-Works Engineers, and published by Otto Meissner, of Hamburg. In § 6, No. 8, of this publication the words: "Rivets of more than 10 mm. diameter are to be hammered in while red-hot," should be substituted for: "The rivets are of, &c."

The strains on the materials should not exceed the following:—

Homogeneous iron	in tension or compression	1200	kilos./square centimetre.	
,,	under shearing strain	900	,,	,,
Cast iron	in compression	750	,,	,,
,,	in tension	250	,,	,,
,,	under shearing strain	200	,,	,,

Dimensions.

The use of the dimensions given in the tables, of which an abstract (in English terms) follows, and more fully in the annexed table and diagram, is recommended. See also p. 636.

Erection of the Gasholder.

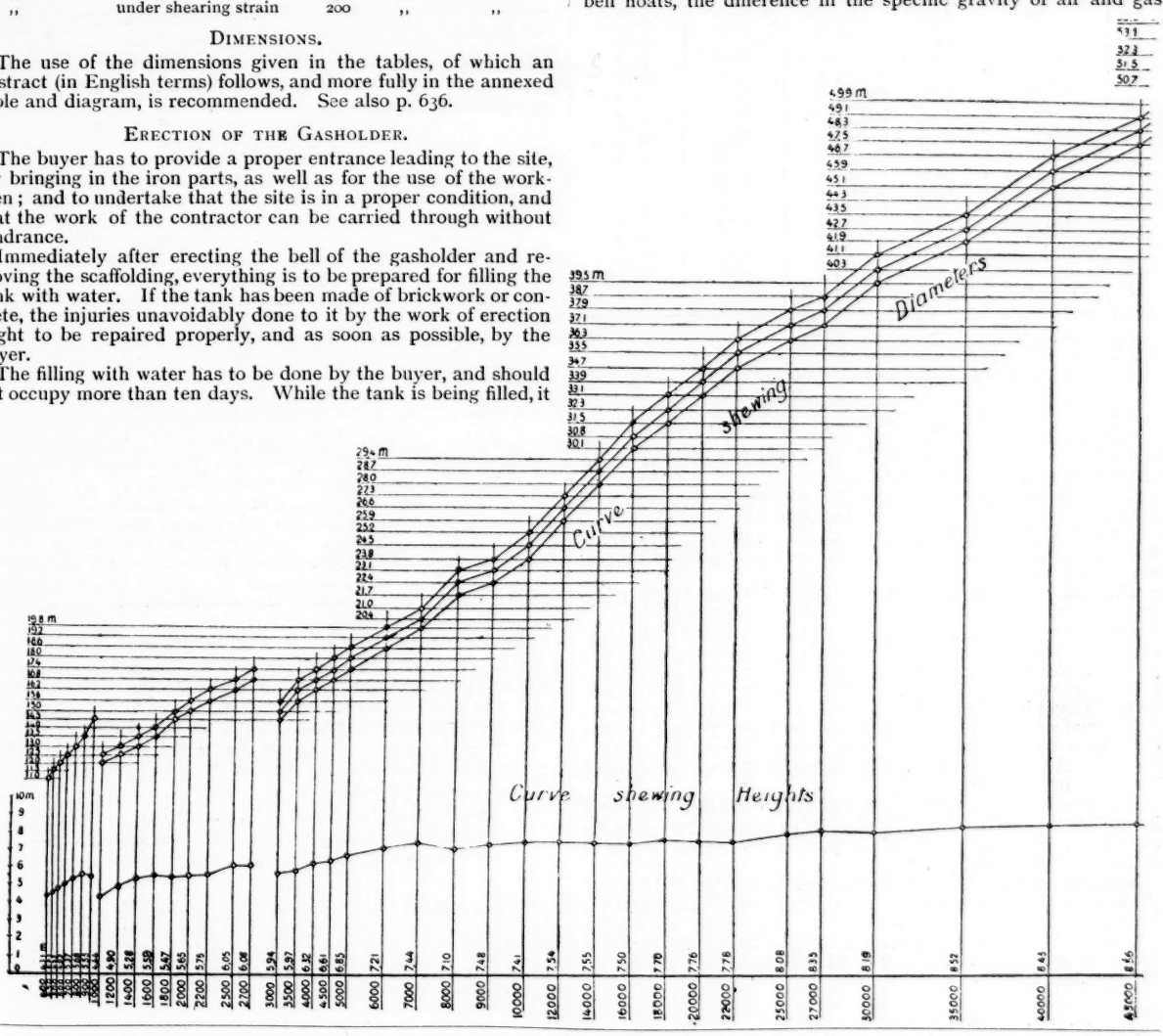
The buyer has to provide a proper entrance leading to the site, for bringing in the iron parts, as well as for the use of the workmen; and to undertake that the site is in a proper condition, and that the work of the contractor can be carried through without hindrance.

Immediately after erecting the bell of the gasholder and removing the scaffolding, everything is to be prepared for filling the tank with water. If the tank has been made of brickwork or concrete, the injuries unavoidably done to it by the work of erection ought to be repaired properly, and as soon as possible, by the buyer.

The filling with water has to be done by the buyer, and should not occupy more than ten days. While the tank is being filled, it has to be inspected with regard to its soundness and strength Any defects which may thus be found are to be completely rectified. An inclination or canting of the tank up to 1 mm. for each metre of diameter should not be objected to.

Should it be necessary, through any fault in the work of the contractor, to empty the tank again, the contractor shall be held liable to pay the costs—in particular those for emptying and refilling the tank. But the buyer shall only be allowed to charge his bare expenses in the event of his furnishing anything in connection with these operations.

After the tank has been filled with water, the bell is to be examined for soundness. To do this, the bell has to be raised by the buyer by means of gas; and he has to brush over all rivet-joints with soapy water. All leakages which may be found are to be removed in such a manner that a permanent condition of soundness of the vessel may be ensured. If the buyer wants any other test for tightness before filling with gas, he must make the necessary arrangements at his own expense; while the contractor will then have to do the brushing with soapy water and making sound. When ascertaining the gas pressure under which the bell floats, the difference in the specific gravity of air and gas



GERMAN COMMITTEE'S PROPOSED STANDARD DIMENSIONS FOR GASHOLDERS.

Data of Typical Examples Abstracted from the Two Original Tables.

[*Metric quantities converted into English equivalents.*]

Number in the Complete Series of Examples.	Standard Capacity.	Diameter of Holder.	Standard Diameter of Outlet Main.	Side Sheets.	Radius of Crown.	Crown Sheets.	Number of Guide Columns.	Depth of Cups.		Thickness of Cup Plates.	Angle Iron of Top Curb, of which the Cross Section is Supplemented through the attachment of the Sheets.
								For 2-lift Holder.	For 3-lift Holder.		
	Cubic Feet.	Feet.	Inches.	Lbs. per Sq. foot.	Feet.	Lbs. per Sq. foot.		Inches.	Inches.	Inch.	Inches.
1	14,100	36·1	5·90	3·28	65·6	3·28	8	11·80	—	0·16	2·0 × 2·0 × 0·35
9	42,400	49·2	8·85	,,	98·4	3·48	,,	,,	—	,,	2·6 × 2·6 × 0·43
10	49,400	51·2	,,	,,	98·4	,,	,,	13·85	15·75	0·20	,, ,, ,,
19	141,200	68·8	14·75	3·48	131·2	3·69	,,	,,	,,	,,	3·1 × 3·1 × 0·47
20	154,000	71·2	15·75	,,	131·2	,,	10	15·75	17·70	0·24	,, ,, ,,
24	282,400	80·3	18·70	,,	164·0	4·10	,,	,,	,,	,,	3·9 × 3·9 × 0·55
34	953,000	103·2	31·50	3·69	196·8	,,	12	,,	,,	,,	,, ,, ,,
35	1,060,000	105·8	,,	,,	196·8	,,	14	17·70	19·70	0·275	,, ,, ,,
38	1,540,000	113·8	39·37	,,	229·7	4·51	,,	,,	,,	,,	5·1 × 5·1 × 0·63
44	—	129·5	—	,,	262·3	,,	16	,,	,,	,,	,, ,, ,,
50	—	145·3	—	,,	295·2	4·92	18	,,	,,	0·315	,, ,, ,,
58	—	166·3	—	,,	328·1	,,	20	,,	,,	,,	,, ,, ,,

No.	Capacity. Cubic Metres.	D 1. Metres.	D 2. Metres.	D 3. Metres.	Height. Metres.
1	400	11·0	..	..	4·31
2	450	11·5	..	..	4·43
3	500	12·0	..	..	4·52
4	600	12·5	..	..	4·99
5	700	13·0	..	..	5·37
6	800	13·5	..	..	5·69
7	900	14·5	..	..	5·55
8	1,000	12·0	12·5	..	4·44
9	1,200	12·5	13·0	..	4·90
10	1,400	13·0	13·5	..	5·28
11	1,600	13·5	14·0	..	5·59
12	1,800	14·5	15·0	..	5·47
13	2,000	15·0	15·6	..	5·65
14	2,200	15·6	16·2	..	5·75
15	2,500	16·2	16·8	..	6·05
16	2,700	16·8	17·4	..	6·08
17	3,000	14·5	15·0	15·6	5·94
18	3,500	15·6	16·2	16·8	5·97
19	4,000	16·2	16·8	17·4	6·32
20	4,500	16·8	17·4	18·0	6·61
21	5,000	17·4	18·0	18·6	6·85
22	6,000	18·6	19·2	19·8	7·21
23	7,000	19·8	20·4	21·0	7·44
24	8,000	21 7	22·4	23·1	7·10
25	9,000	22 4	23·1	23·8	7·48
26	10,000	23·8	24·5	25·2	7·41
27	12,000	25·9	26·6	27·3	7·54
28	14,000	28·0	28·7	29·4	7·55
29	16,000	30·1	30·8	31·5	7·50
30	18,000	31·5	32·3	33·1	7·70
31	20,000	33·1	33·9	34·7	7·76
32	22,000	34·7	35·5	36·3	7·78
33	25,000	36·3	37·1	37·9	8·08
34	27,000	37·1	37·9	38·7	8·35
35	30,000	39·5	40·3	41·1	8·19
36	35,000	41·9	42·7	43·5	8·52
37	40,000	45·1	45·9	46·7	8·43
38	45,000	47·5	48·3	49·1	8·56
39	50,000	50·7	51·5	52·3	8·37

must be taken into consideration. When observing the position of the bell when the inlet and outlet valves are closed, it should be remembered that the water of the tank absorbs air, as well as gas, up to a certain degree of saturation, dependent on its temperature and general condition. Furthermore, it must be remembered that the temperature of the air or gas in the bell is seldom uniform; and with gasholders not enclosed in houses, it will be strongly affected by sunshine and even by the cloudiness of the sky.

With regard to the plumbing of the guide-rails, a variation of not more than 5 mm. from the vertical should be allowed.

When being tested, the bell is to make a complete flight up and down without jamming in the guides, and with an inclination of not more than 1 mm. per metre diameter.

The guide-rollers are to be turned concentrically and thoroughly on their running surfaces, and should be fixed on turned axles.

Between the sheets, which have to be riveted gas-tight, a strip of sacking or webbing soaked in oil and red lead will be placed as packing. After riveting, any packing strip which projects beyond the edges must be cut off neatly with a sharp knife. Bolts are to be made tight by twisting fibres of hemp round them. The constructional parts of the angle-ring or curb are to butt against each other so that the transmission of pressure will be effected by the total sectional area, and the tightness of the joints secured by means of the fish-plates.

The cups should be water-tight, and are to be filled with water immediately after they have been made, in order to be tested for soundness. The water which is required for this operation is to be furnished by the buyer.

The iron parts are to be cleaned before being despatched, and then to be covered with a coat of red lead. After the holder has been riveted together, the rows of rivets and joints must receive another coat of red lead from the outside, as well as from the inside of the holder. Further coating is to be left to special arrangements.

Guarantee.

For all injuries and defects due to faults in construction, bad material, and faulty execution, the contractor is held responsible for a period of one year after inspection. For superficial flaws which may occur, an amount up to 1 per cent. of the total sum can be deducted.

Payment.

Payment will be made according to weight, unless a certain sum, including everything, has been agreed upon. In the first case, the contractor has to send in the weights of each consignment immediately after despatch. The buyer has to examine these figures directly after the arrival of the consignment, and he will have to notify the contractor within five days if his statements should prove to be incorrect; otherwise the weight given by the contractor will be considered correct. Overweight amounting to not more than 3 per cent. above the stated weight will be paid for at standard price; underweight will be deducted at the same rate. Pieces of more than 5 per cent. underweight are liable to be condemned.

Time of Delivery and Penalty for Delay.

The day the erecting foreman starts the work of erection shall be considered the commencement of building. The work is to be reckoned as completed when the gasholder is ready to be filled with water. In the case of contingencies arising which the contractor was not able to foresee, the period of delivery may be extended. Any stoppage of work, &c., in contractor's own works or in the iron-works and collieries entrusted with the supply of material, as well as want of trucks, are considered as such contingencies. But the contractor is obliged to give notice to the buyer of such occurrences. Should the buyer be behindhand in the buildings to be carried out by him or a third party, and so cause delay in the work of the contractor, the time for delivery is to be deferred accordingly.

* * * * * *

If the contractor does not complete his work within the specified determined limit of time, the buyer shall be entitled to deduct a fine of $\frac{1}{2}$ per cent. of the amount for the total work for every completed week. Differences which may arise between the contractor and buyer shall not hinder the latter from making use of the gasholder.

Terms for Payment.

The payment of the cost price shall be made in cash in German new Imperial standard—viz., one-third at the beginning of the erection, one-half at the completion of the building, and one-sixth three months after the erection has been completed. Section 636 of the first division of the Civil Law is not to apply to the contract made for delivery.

* * * * * *

Court of Arbiters.

In all dissensions which may arise between the buyer and contractor, a court of arbiters shall decide, without recourse to Law Courts.

* * * * * *

Special Directions.

(*a*) The rivets for the sheets of the sides and roof shall be from 6 to 8 mm. (0·24 to 0·32 inch) thick.

(*b*) The pitch of rivets for the same sheets from 25 to 30 mm. (1 to 1·2 inches).

(*c*) The overlapping shall also be from 25 to 30 mm.

(*d*) It is not necessary that the joints of the sections of the curb, of the cups, and of the dipping ring shall coincide with the angles of the polygon of the gasholder. They also need not be at equal intervals from the angles of the polygon.

(*e*) The joints of the side sheets need not coincide with the polygon divisions of the holder; and it is also not necessary that they should be alternated. On the contrary, the vertical rows of rivets may be made straight through throughout the entire height of the particular lift of the holder at any place in the circumference of the holder where they will not be covered by other parts of the construction.

(*f*) The sheets of the roof are to be arranged in concentric rings, and must taper radially. The overlapping of the concentric seams shall be turned outwards and upwards.

(*g*) At the bottom of the tank, resting blocks not less than 100 mm. (4 inches) high must be provided, and securely fastened.

(*h*) The upper surfaces of the dips and top curb of the bell shall, when in a state of rest, lie below the top-edge of the tank by an amount equal to Z.

For single-lift holders - - - - $Z = 150$ mm. (6 inches).
For two-lift telescopic holders - $Z = 170$ mm. (7 inches).
For three-lift „ „ - $Z = 200$ mm. (8 inches).

Note.—All who are interested are requested to send to the Commission for Standards for Gasholders answers to the following questions: (*a*) How the dimensions given in the table have worked in particular cases. (*b*) What amendments and further particulars they have to propose.

Manchester and District Junior Gas Association.—The next meeting of the Association will be held in the Technical School, Manchester, on Saturday, when various subjects of interest to the gas industry will be introduced for discussion. In the circular announcing the meeting, the Hon. Secretaries (Messrs. Wellens and Oldfield) draw the attention of the members to the article on "The Sons of Engineering and of the Gas Industry" in the "Journal" for the 18th ult., and request them to read it carefully, so that something may be decided at the meeting as to whether or not the Association shall take up the matter dealt with therein in conjunction with the senior Associations.

Gas-Engines in Germany.—The employment of gas-engines in large industries is daily extending in Germany. The firm of Körting, of Körtingsdorf, near Hanover, who have made a speciality of gas-engines for electric light works, have been very successful. At the present time, most of the dynamos in that locality are driven by gas-engines. We learn from the "Moniteur Industrielle" that the Prussian State Railways, and more recently the other German State lines, have adopted the same system. They have abandoned the primitive plant for lighting in favour of gas-engines as the source of power for the production of current. This change has been made even in the largest railway stations. In most cases the engines are fed by generator gas.

REGISTER OF PATENTS.

Clearing Gas-Retort Ascension-Pipes.—Trewby, G. C., of Horseferry Road, S.W., and Biggart, A. S., of Glasgow. No. 5094; March 11, 1901.

The object of this invention is to obviate the need for employing hand labour, and to lessen the cost of removing obstructions to the free passage of the gas, by providing mechanically-operated means for clearing the ascension-pipes. The apparatus comprises a cleaning-tool, which may be of corkscrew or other formation analogous to that of the ordinary hand-cleaning tool, but carried upon the end of a flexible shaft to which a longitudinal movement is imparted, either alone or in conjunction with a rotary motion, and which is guided by a suitable nozzle or guide-tube to direct the tool to any required inclination into the mouth of the ascension-pipe of any of the retorts in the bench.

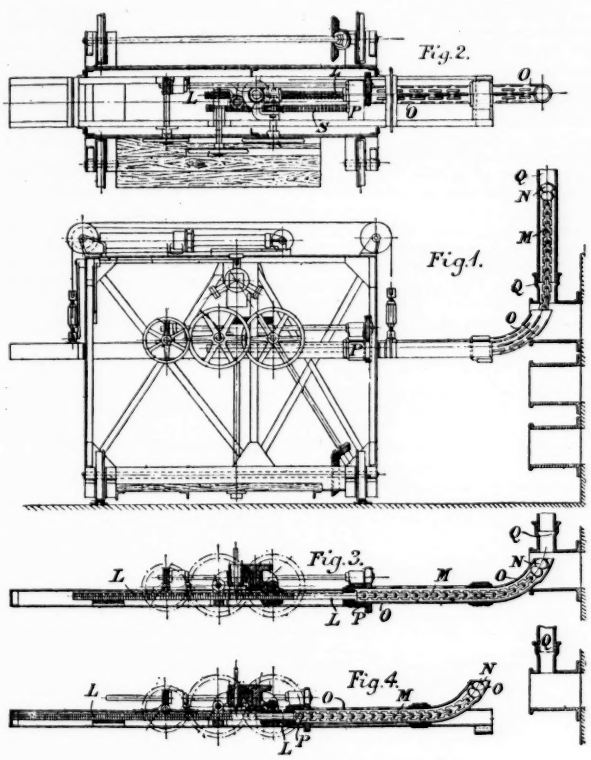


Fig. 1 is a longitudinal elevation, and fig. 2 a plan of one modification of the apparatus. Figs. 3 and 4 show the clearing device in two different positions.

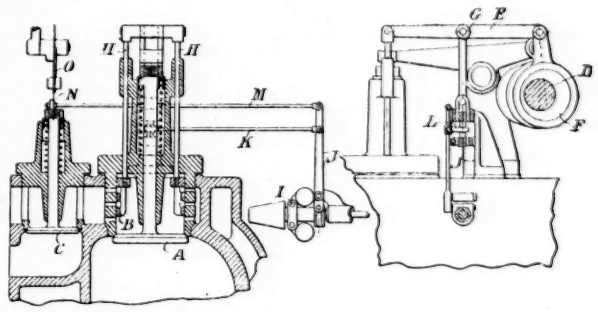
The machine for carrying and operating the cleaning-tool consists of a carriage, composed of an open framing suspended from an overhead railway, but preferably furnished with wheels and adapted to be traversed on rails in front of the retort-bench by means of gearing connected to the wheel-shaft or axle, and controlled by an attendant. Upon the carriage is suspended a horizontal or inclined beam or frame I, adapted to be raised or lowered by a hydraulic ram and chains or other gearing, to bring it in line with any one retort in the bench. On this beam or frame is mounted a long cylinder, whose ram or piston-rod has secured at its free end the flexible shaft M carrying the cleaning-tool N; or the flexible shaft may (as shown) be secured to the end of a circular rack-shaft L. The guiding tube or nozzle O, in which the shaft M is carried, is connected by a crosshead P to the ram or piston-rod or to a rack S, so that by the movement of the ram or rack, actuated by a hand-wheel, it is projected forward from its normal position in front of the retort (fig. 4) to a point within the retort-mouth, as shown at fig. 3, with its extreme end immediately under the ascension-pipe Q; while the cleaning-tool remains within the guiding-nozzle O. The forward movement of the rack L by the action of the hand-wheel then drives forward the flexible shaft M and tool N, so that it is forced out through the nozzle, and thereby guided up into the ascension-pipe Q.

The formation of the cleaning-tool N may be such that its traverse through the mouth of the ascension-pipe suffices to clear the pipe; but for the purpose of more effectually doing this, it is preferred to impart a rotary movement to the tool. In such case, a pinion is fixed on the shaft M or on the ram; or (as shown) a bevel pinion is fitted in a bracket surrounding the circular rack-shaft L, and connected to the shaft by a feather fitting into a longitudinal groove in the rack, so that the latter may have a longitudinal as well as a rotative movement. The pinion is geared with a rack, which may be traversed to-and-fro by a hydraulic ram placed transversely whereby rotary motion is imparted to the shaft and the tool, either during the forward or backward traverse of the flexible shaft or while the cleaning-tool remains in the ascension-pipe.

After effecting the clearing operation, the rack-shaft L is drawn back by the action upon it of the hand-wheel, and withdraws the tool N from the ascension-pipe Q, so as to bring it within the guiding-nozzle —the sliding nozzle being withdrawn from the mouth of the retort to the position shown in fig. 4 by the action of the toothed wheel upon the rack S; suitable stops or catches being provided to facilitate these movements of the parts upon each other.

Internal Combustion Motors.—Crossley, W. J., of Manchester, and Atkinson, J., of Marple. No. 5398; March 14, 1901.

The object of this invention is to vary the amount of power given out by an internal combustion motor per impulse, by cutting off admission during the suction stroke, at points automatically varied by the governor, in such a manner that for lighter loads the cut-off takes place earlier, and for heavier loads later; while for full load the admission continues to the end of the stroke—the richness of the mixture being more or less uniform for all points of cut-off, but subject to regulation of the gas-cock and the timing of the opening and closing of the gas admission-valve so as to best suit the average load for the time being. The admission and gas valves are such as are commonly used for this purpose in engines operating on the "Otto" or four-stroke cycle.

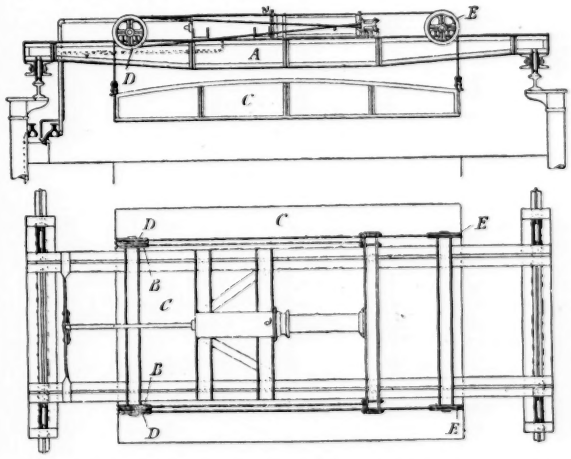


In the arrangement shown, A is the admission-valve; B, the cut-off valve, placed inside the casing of the admission-valve; and C, the gas-valve. The side shaft D revolves once for two revolutions of the crank-shaft, and operates the admission and gas valves in any usual way—say, by means of cams and levers. The cut-off valve is operated by an additional lever E, which is driven uniformly to-and-fro by means of an eccentric F. The lever rocks on a fulcrum G—thus moving the cut-off valve by means of two connecting-rods H, one on either side of the spindle of the admission-valve.

The position of the fulcrum is moveable under control of the governor I, through the lever J, track-rod K, and the piece L, which consists of a spindle having at one end a right-handed thread and at the other end a left-handed thread; the track-rod K being connected to a short lever on the spindle, so as to revolve the spindle in accordance with the movements of the governor. When the motor is required to give full power, the governor decides the position of the fulcrum G, so that the ports in the cut-off valve do not close the ports in the casing of the admission-valve until the suction stroke is completed; but if the motor has any tendency to increase its speed, owing to reduction of the load, the fulcrum is moved so that the ports close earlier, and at any desired portion of the suction stroke. The volume of charge drawn into the cylinder during any suction stroke is thus decided by the governor. If full charges are not drawn in, the continued motion of the piston during the remainder of the suction stroke causes the contents of the cylinder to expand below atmospheric pressure. On the return compression stroke, the charge is compressed up to atmospheric pressure in the first instance, and then to a higher pressure—being ignited in any usual manner, at the proper time, so as to give a working stroke which will develop a suitable amount of power to keep the motor running at uniform speed as decided by the governor irrespective of the load.

Operating Gas-Purifier Lids.—Smith, B. G., of Halifax. No. 5553; March 16, 1901.

According to this invention, on the travelling carriage A is fixed a hydraulic cylinder, the ram of which is bolted to a moveable cross-girder or frame supported by rollers resting on rails. Fastened to each end of the moveable girder are two ropes or chains passing over pulleys B, mounted one on each side of the carriage, and fastened to one end of the gas-purifier lid C. The ropes pass under, and partly round, the pulleys D, and over other pulleys E mounted one on each side of the carriage above the opposite end of the gas-purifier lid, to which end, or to each corner, the ropes are connected.



The carriage is travelled along its rails to the required position over the purifier-lid to be raised. The water-pipes are connected together

by a flexible tube, and the taps or valves opened. Water passes into the hydraulic cylinder, thereby forcing out the rams and the cross-girder or frame, and drawing the rope over the pulleys B and E, and lifting the purifier-lid from each of its four sides simultaneously. To lower the lid, the water taps or valves are closed, and the pipes uncoupled. The water is thereupon expelled by the weight of the lid, as the latter gradually falls and forces the ram into the cylinder—the waste water passing to a trough or any convenient outlet.

Automatic Gas-Ignition Devices.—Boult, A. J.; a communication from P. Lehmann and T. A. Scheele, of Berlin. No. 6611; March 29, 1901.

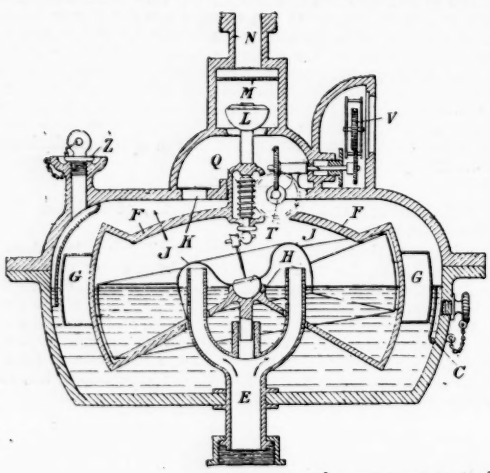
It has been usually assumed up to the present time, say the patentees, that, on opening the tap of an incandescent light burner provided with a chimney, the space of the latter is uniformly filled with an explosive mixture of gas and air. According to careful researches, however, this is found not to be the case; but a comparatively small, narrow, and limited space is found in the chimney in which the mixture of gas and air is of such a nature that a chemical lighting mass can be brought to a glowing state and the gas ignited. With a newly-mounted, evenly-formed incandescent mantle, with a vertical mantle-support and normal burner, this space will, it is said, lie in the centre of the chimney. These conditions are, however, seldom met with; and the shape of the incandescent body, the inclined position of the support, and differences in burners necessitate a considerable variation in the position and form of the explosive gas-air zone suitable for automatic chemical lighters. Experiments have shown that very often more than half the space enclosed by the chimney is without an effective mixture of gas and air; so that an ignition ball hanging in this part is not even warmed, far less brought to a glowing state.

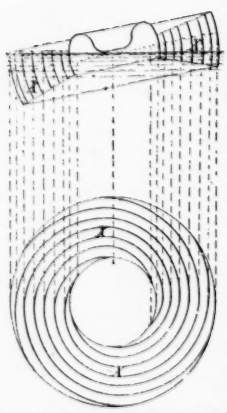
According to the present invention, upon the chimney is placed a narrow cross-bar provided with numerous recesses arranged closely together—the cross-bar being in the form of a corrugated or notched strip of metal, or a notched or screwed rod, or the like. Upon the bar is suspended, by a hook or eye, the self-igniting device, which, by means of a handle, can easily be moved from one point to another along the bar.

In this way, the place can soon be found which is most convenient for the ignition. A circular guard-plate is arranged under the ignition ball, so as to prevent overheating of it. While the burner is alight, it remains quite black; but its ignition-threads are quite white. At the same time, the plate prevents the falling down of platinum particles upon the mantle where the same, in combination with thorium oxide, even in small quantities, would form large spots, which, in burning, would remain dark red, and affect the intensity of the light.

Gas-Meters.—La Société Industrielle des Compteurs, of Paris. No. 7161; April 4, 1901. Date claimed under International Convention, Sept. 25, 1900.

This gas-meter is characterized by the employment of a special arrangement of oscillating bell divided into compartments of spiral form extending from the centre (at which the gas to be measured is admitted) towards the periphery, where the gas is delivered after





measurement; the compartments being bounded laterally by partitions having a spirally curved surface, all the vertical sections of which form arcs of circles having for their centre the point of oscillation of the bell. The bell is inclined above the plane of the liquid, and thus receives, under the action of the gas, a circular undulatory movement, without, however, turning upon itself; while the upper end of the spindle, which is fixed in the pivot of the bell, is caused to describe a circle.

The meter comprises a casing containing a fixed liquid (such as oil or glycerine); the casing being provided with an overflow C closed by a stopper, and with a gas inlet-pipe E at its lower part. The lower part of the casing has a flange, upon which is fitted the flange of the cover which carries the registering mechanism. It is also provided with a filling orifice Z. Beneath the cover is mounted a skeleton frame F, so as to allow the liquid to pass in and the gas to pass out of the frame. The frame, which is of annular form, is supported by a peripheral annular float G, whereby the bell is maintained in suspension; the float being so balanced as to cause the centre of gravity of the frame and bell to coincide with the centre of oscillation.

The frame has a central socket H to receive a spherical pivot upon which, as an axis, the bell J is supported and oscillates. This oscillating bell is divided into six or other number of compartments of spiral form, the divisions between the several compartments presenting curved spiral surfaces, which, in vertical section, are curved to arcs of circles concentric with the point of oscillation of the bell, so as to absorb in work only the friction of the compartments and not of the acting surfaces. This advantage, it is said, tends to "always maintain the apparatus in such position that the plane of the liquid passes exactly through the centre of oscillation." The admission to each compartment ceases just before the exit orifice emerges above the level of the liquid.

The gas entering the meter at E passes up through the branch pipes which extend above the level of the liquid; and on reaching the compartment X, exerts a pressure in this compartment which at its other extremity is only subjected to the outlet pressure—the resultant of the pressures having for effect to communicate to the bell an angular oscillating movement. The successive entrance of gas into the different compartments produces a series of successive forces, which communicate to the bell a circular undulatory movement. The space filled by the gas thus goes on increasing in capacity until the moment when, by the immersion of the inlet end of the compartment in the liquid, the gas can no longer enter; but the gas continues its action upon the next following compartment, and so on.

The gas, after thus acting upon the bell, fills the space beneath the cover, passes through the orifice K, beneath the valve L forming part of the float mechanism, through orifices in the protecting disc M, and thence, through the outlet N, to the service-pipe. The outlet orifice K is regulated by a diaphragm, having an orifice corresponding to the output of the meter at normal speed. The circular undulatory movement of the bell is transmitted by an arm and crank, which receive circular movement to an endless screw Q driving a worm wheel, which, by means of another endless screw T, drives the train of gearing of the counter V, whereby the supply of gas is registered.

Mouthpieces and Lids of Gas-Retorts.—Holmes, E. D.; a communication from O. N. Guldlin, of Fort Wayne, Indiana, U.S.A. No. 25,495; Dec. 15, 1901.

One of the special objects of this invention is to provide openings of equal size in the hinge-ends of both forks of the cross-bar to receive the eccentrics on the pintle of the closing lever; and to apply to the lower and smaller eccentric of the pintle a detachable and wearing washer of the same diameter as the upper eccentric. The wearing washer is rigidly clamped against the lower shoulder of the pintle around the smaller eccentric, so that it shall not bind the pintle in the hingepiece of the mouthpiece.

Fig. 1.

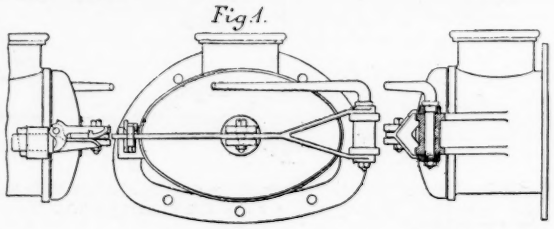


Fig. 2.

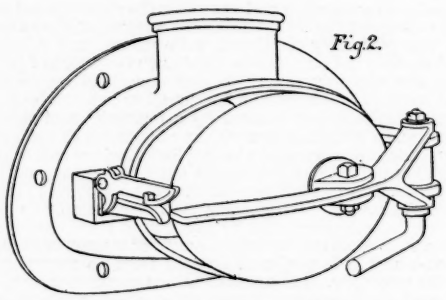


Fig. 1 represents a front elevation of the mouthpiece and lid with the fastening device applied thereto; also, side elevations on opposite sides. Fig. 2 represents a perspective view of the mouthpiece and lid with the improvements applied thereto.

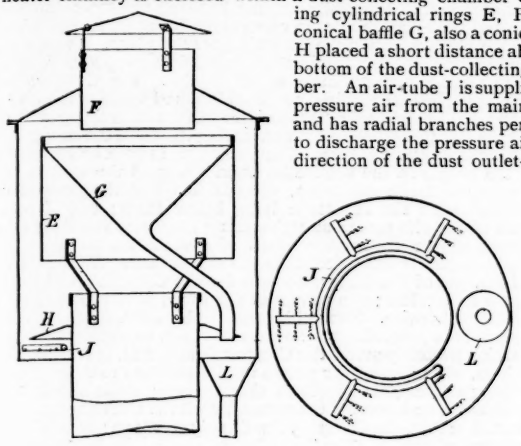
The mouthpiece is of the usual character, and has cast upon one side a lug forming the hinge-piece. The elliptical or oval cover is of the usual construction, and is connected centrally to the cross-bar by means of the lugs and a pin preferably provided with an eccentric (not shown). The cross-bar is made of two forks of V-shape at the hinge end. The ends of both forks are formed with eyes of the same diameter, for receiving the upper and lower eccentrics of the pintle. This is preferably an integral part of the clamping or closing lever, being forged with it. Since the long part of the pintle (passing through the hinge part of the lug) must be a working fit, it was formerly necessary to provide the lower end with a small eccentric, so that the pintle could be readily passed through the opening in the hinge part. This smaller lower eccentric, therefore, was subjected to great strain, and very soon gave out by the wear, while the other parts were in good condition. In order to overcome this difficulty, and also to provide for conveniently boring both forks of the lever with openings of the same diameter, there is applied to the lower eccentric a wearing collar or washer. The upper eccentric is made large, and the lower eccentric small, in the usual manner. Upon the lower eccentric is applied the wearing washer, which is of the same diameter as the lower eccentric,

and completely fills the opening in the lower fork of the cross-bar. The washer bears against the shoulder of the pintle, and is rigidly held against it by means of a nut applied to the screw-threaded end of the pintle. By this means, the washer is prevented from turning on the small eccentric, while the long hinge part of the pintle is left free to turn without binding in the opening of the hinge part.

The other features of the improvement will be appreciated by reference to the illustrations.

Dust-Interceptor for Water-Gas Generators.—Cutler, S., of Millwall, E. No. 246; Jan. 3, 1902.

According to this arrangement, the upper part or head of the superheater chimney is enclosed within a dust-collecting chamber containing cylindrical rings E, F, and a conical baffle G, also a conical plate H placed a short distance above the bottom of the dust-collecting chamber. An air-tube J is supplied with pressure air from the main blast, and has radial branches perforated to discharge the pressure air in the direction of the dust outlet-pipe L.



The conical baffle G forms a collecting hopper for dust, and has an outlet-pipe discharging into themain outlet. The ring F is surmounted by a cowl.

In operation, the gases passing up the chimney impinge upon the baffles and rings and the cowl, and are freed from dust, which is in part precipitated into the hopper G, and in part upon the conical plate H, passing thence into the lower collecting chamber, where, by the action of the pressure air, it is discharged into the outlet L, and passes to a suitable receiver.

APPLICATIONS FOR LETTERS PATENT.

3997.—Gibbons, W. P. & G. B. A., "Charging gas producers for gas-retorts." Feb. 17.
4002.—Daniels, J. S. & F. L., "Gas-producers." Feb. 17.
4011.—Graham, H. B., "Gas-engines," Feb. 17.
4037.—Peck, W., "Internal combustion engines." Feb. 17.
4071.—Lauder, G. M., "Burners for acetylene and other illuminating gas." Feb. 18.
4080.—Neil, A. & W. R., and Fletcher, Russell, and Co, Ltd., "Gas-cooking ranges." Feb. 18.
4130.—Dudgeon, A. J., "Gas or other engines." A communication from the Société Anonyme John Cockerill, and H. Savage. Feb. 18.
4151.—Duffek, A., Wien, H., and Beschorner, A., "Incandescent gas-lamps." Feb. 18.
4162.—Haddan, H. J., "Internal combustion engines." A communication from J. S. Rogers. Feb. 18.
4166.—Boult, A. J., "Gas-furnaces." A communication from H. Fargue. Feb. 18.
4278.—Lothammer, F. J., "Motive power generators." Feb. 19.
4353.—Forbes, C. S., "Manufacture of acetylene." Feb. 20.
4371.—Tejada, J. de D., "Acetylene gas generators." Feb. 20.
4399.—Austin, E., "Gas or oil engine." Feb. 21.
4467.—Glover, R. T. & J. G., "Coin-freed gas-meters." Feb. 21.
4472.—Rowbotham, W. & K. A., "Gas and like engines." Feb. 22.
4483.—Redman, T., "Incandescent gas-burners." Feb. 22.
4533.—Lassahn, T., "Regulators for gas-burners." Feb. 22.
4534.—Biheller, S., "Incandescent lighting." Feb. 22.
4569.—Scott-Snell, C., "Self-intensifying pressure lamps for incandescent gas lighting." Feb. 22.
4618.—Wright, F., "Preventing fraud in coin-freed apparatus." Feb. 24.
4646.—Maybluh, C. F., "Process and apparatus for the desulphurization of sulphurous substances, and the treatment of the spent substances in the purification of gas." Feb. 24.
4675-6.—Shillito, T. R., "Valve appliances for regulating the supply of gas to gas-jets." A communication from G. Goliasch and Co. Feb. 24.
4718.—Gillibrand, F. J., "Internal combustion engines." Feb. 25.
4760-1.—Gibbons, W. P. & G. B. A., "Collecting and carrying coke and coal from gas-retorts." Feb. 25.
4762.—Gibbons, W. P. & G. B. A., "Facilitating the emptying and refilling of gas-purifiers." Feb. 25.
4802.—Sugg, W. T., "Water-motors." Feb. 25.
4809.—Campbell, H., "Internal combustion engines." Feb. 25.
4821.—Parkinson and W. & B. Cowan, Ltd., Parkinson, B. R., and Wilkes, L. G., "Gas cooking-stoves." Feb. 26.
4835.—Parkinson and W. & B. Cowan, Ltd., and Parkinson, B. R., "Gas cooking-stoves." Feb. 26.
4838.—Gibbons, W. P. & G. B. A., and Ivern, P., "Acetylene torch for lighting street-lamps." Feb. 26.
4842.—Burt, P., "Gas-producers." Feb. 26.
4848.—Larkin, F. S., "Buffers for hydraulic charging and drawing machines for gas-retorts." Feb. 26.
4901.—Godwin, A. H., Keil, F. A., and Dougall, J., "Manufacture of coal gas." Feb. 26.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Eastbourne Gas Company's Meeting.

Sir,—Permit me to just put a word of modification to the well-meant article on the report of the Eastbourne Gas Company's meeting, in which is repeated the chance remark of the Company's Auditor (Mr. Worley), that Mr. Hammond had "lost his head." Those who know Mr. Hammond well know that he has a pretty hard head, and does not easily "lose" it. I am sure Mr. Worley did not believe that his remarks would be quoted in a journal so widely circulated as yours, or he would have himself modified the term.

In justice to a very energetic and most capable fellow worker, I should like to explain that I believe Mr. Hammond, through a too candid credence to the unfair representations that were made to him by those who ought not to have exaggerated the condition of the coal market at the time, was led to believe that it would be difficult to secure coals sufficient to maintain his stock except by forecasting his requirements far ahead. The Company's coal supplies had been kept so short during the previous winter, that Mr. Hammond was often in my office in London asking for some means of tiding over the severe straits to which he was reduced by what I must say was the failure to treat him fairly by those supplying the Company with coal. So severe were these straits, that two days' consumption measured at one time the amount of stock. Most of the companies who were not at that time also employing oil for gas-making, were in very similar straits; but this did not remove a very painful and anxious pressure from Mr. Hammond, who, I do not hesitate to say, was misled, not to say imposed upon.

I regret that, in the hurry of speaking at the meeting, I did not, as I intended, refer to the expression as too strong.

Stepney, E., March 8, 1902. Hy. E. Jones.

[In connection with the above letter, we may refer our readers to an editorial paragraph on the subject, appearing to-day, which was already in type when Mr. Jones's communication came to hand yesterday.—Ed. J.G.L.]

Mr. Charles Hunt and Percentage Increases.

Sir,—I am a little puzzled over one part of Mr. Hunt's address to the members of the Midland Association; but I have hesitated to write for an explanation—in the first place, because I do not like to suggest that Mr. Hunt has committed a fundamental error in calculation, and, in the second place, because I have feared to incur his displeasure in the event of the oversight being on my side. But I feel so interested in the matter that I am going to run the risk.

The point is in the portion of the address where Mr. Hunt makes a comparison of the increases in gas consumption of companies and local authorities during the period 1895 to 1899. "Figures," the sage tells us, "can be made to prove anything;" and here we have an instance—Mr. Hunt being able, by working out to percentages the increases on the consumptions of 1895, to show an advantage on the side of the local authorities. But, from my point of view, the percentages are deceitful, in that the consumption for the companies and for the local authorities were not equal in the first-named year. The companies showed a consumption of 49,632 millions in 1895, while the local authorities only had a consumption of 40,465 millions. Now, in the years following up to 1899 both companies and local authorities obtained an increase of close upon 10,000 millions; and naturally one can make this show a greater percentage on 40,465 millions than on 49,632 millions. With £10 no one can pay such a large percentage dividend on £120 of capital as he can on £100.

Without going into the matter preceding the table in which these figures appear, I will content myself by claiming that the figures quoted by Mr. Hunt are strictly in favour of the sliding-scale gas companies. The 175 of them had attained to a far larger measure of success (perhaps through the operation of the sliding-scale) than 202 of the local authorities by 1895; and the 175 companies were able to show a larger increase in bulk than the 202 local authorities between 1895 and 1899. Again, local authorities as a rule only buy successful gas-works in good districts; and this being so, together with the fact that there are 27 more of them than of the companies, is it not to the shame of the authorities that they do not exhibit such a large total increase as the companies?

March 8, 1902. A Gas Shareholder.

Bedford Water Bill.—At a recent statutory meeting of the ratepayers, consent was, by a large majority, given to the promotion of a Water Supply Bill by the Bedford Corporation. The source will be the greensand near Henlow, 10 miles from Bedford. The Mayor stated that the capital expenditure would be about £80,000, and the scheme would involve increased rates of 2¾d. in the pound.

Loss on the Gainsborough Gas-Works.—At the meeting of the Gainsborough Urban District Council on Monday of last week, the first profit and loss account of the gas undertaking, which the town acquired at an expenditure of £85,000, was presented. It covered a working period of fifteen months, and showed an adverse balance of £850. This was, however, more than accounted for by the heavy price of coals; and the Committee state that they have every reason for saying that the concern can be made profitable to the town. The revenue in the period named amounted to £14,843; and the total expenditure (including repayments of loans and sinking fund), to £15,693. In the first three months after the Council had purchased the undertaking, they managed the concern in conjunction with the officers and Directors of the late Company; and their first duty was to secure a year's supply of coal. They accordingly bought 8000 tons of best gas coal; but a year's experience showed that they had purchased too much. The total amount paid for coal during the period showed that, had they been able to buy at the same price as the Company, there would have been a profit on the works of £1550, instead of the adverse balance of £850.

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

It is many a year since the work in the Parliamentary Committees began in such a tame manner as this session's has done. This is probably due to two causes—First, that there are few schemes of magnitude to engage the attention of Committees; and, secondly, that the Committees have been set to work unusually early, and that, consequently, there may be few measures sufficiently far advanced in preparedness for scrutiny by the Committees. So far, the corridors and rooms have had the barren appearance presented at the end of a session rather than the busy scene one expects at the beginning. By to-day a fortnight's work has been accomplished, and, considering that only three Committees have been sitting a sufficient length of time to make any headway, a fair number of Bills have been cleared off the list. The first to sit was a Commons Committee on the 25th ult.; two days later a second Committee of the Lower House got to work; and last Tuesday a Committee of the Upper Chamber put in an appearance. The Commons Committees so far selected do not include many of the old hands; the Committee of Selection having apparently been taking a run among the younger members of the House. So far as gas and water measures are concerned, there is nothing in the Bills before Parliament, as was pointed out recently, which forebodes exciting times. Some of our consulting engineers have been retained in connection with several of the opposed measures; but certain of those whom the habitué of the corridors is accustomed to see there will this year, in great part, be spending halcyon days in looking after constructional work, the fruits of previous parliamentary engagements.

Good Ventilation and Legislation. By the way, while writing of general matters, it may be mentioned that there has been a change made in Committee Room No. 6—presumably in the way of experiment—by the provision of ventilating arrangements. At the back of the room air-admission shafts have been fixed to about a third of the height of the wall, and near the top of each of the two large windows are a couple of ventilating-fans, apparently worked by electricity. If this is merely a trial, it is to be heartily hoped that it will prove successful, and the system applied throughout the rooms, as in the height of summer they, when crowded, at times become almost unbearable in their sweltering stuffiness. Anything in the way of relief will be welcomed; and such an improvement may aid in the cure of the somnolency, listlessness, and oppressed demeanour occasionally apparent after the luncheon interval, and after the close attention to work in the morning. No one really knows what effect good ventilation would have upon Private Bill Legislation, after the novelty of the little whirling machines in the windows has worn off, and no longer distracts attention.

An Agreed Transfer. The first Gas Bill to be dealt with was one of those over which the parties were confessedly on the verge of agreement; and yet, King's Counsel, Parliamentary Agents, and Consulting Engineers were not—well, let us say, strong enough to pull them over the slender dividing line until they were all assembled before the Committee of which Mr. W. S. Caine is Chairman. It is a far cry from Abercarn to Westminster; and yet the parties journeyed the distance. For what purpose? Was it to hear the Hon. J. D. Fitzgerald, K.C., tell the Committee that the Bill was one for the purchase by the District Council of the Abercarn and Newbridge Gas Company's undertaking, the capital of which is £7380; that the Directors had intimated they were willing to sell; and that the only question was as to the price to be paid? Then Mr. Ram, K.C., for the Company, with, under the circumstances, provoking coolness, interposed with the remark that he thought a short adjournment would produce a satisfactory arrangement, which confession brought from the Chairman the well-merited rebuke: "I think you might have settled the matter before coming into Court." All this passes the wit of the common-sense layman; but still he is at liberty to entertain certain private opinions on the subject. A few minutes did suffice for bringing an agreement to a head; and the parties shook hands over the undertaking changing ownership at £10,875. In addition to this sum, the Council are, by the decision of the Committee, authorized to borrow £20,000 for the extension and improvement of the works and for working capital—the period assigned for repayment being 40 years. The sum requisite for the costs of the Act is to be repaid in five years. It is understood that the purchase money is £2000 more than the Council's first offer; but the ready settlement in the Committee room, without the bandying of words, tells its own tale. If the works were worth £10,875 in Westminster, how much more was their value in Abercarn before expenses in parliamentary opposition were incurred?

Fareham Gas. The same Committee on the same day disposed of the Fareham Gas Company's Bill. Really the only points at issue between the promoters and the Council were the amount of capital and the standard price. The existing share capital is £10,000 and the loan capital, on the old basis, £2000. The Company asked to be allowed to raise £30,000 additional share capital and £10,000 loan, with a standard price for gas of 4s. 3d. per 1000 cubic feet. Mr. H. E. Jones and Mr. Joseph Cash gave evidence for the Company, and Mr. W. A. Valon for the District Council, who considered both the capital asked for and the standard price too high. However, the Bill was passed; the Committee allowing the Company £24,000 share capital, and one-third loan, with the standard price asked for.

Parliamentary Eccentricities. In a little note in the "Journal" a few weeks since, it was stated that, although there was not much prospect of exciting events in the Committee rooms this year, it would indeed be a flat session if it did not produce its little surprises. We have not had to wait long for the first; and, forsooth, there is something very droll about this one. The joke will be found in the decision of the Commons Committee on the Broadstairs Gas Company's Bill. Before making special reference to it, however, it may be mentioned that the Company is a prosperous one; and the town is rejoicing in a fast rise in popularity as a seaside resort. This is not astonishing, as it has a natural beauty far above the ordinary; and the District Council have been doing their utmost of late years to add to the attractions. The Gas Company have benefited; and now they find it necessary to extend their capabilities. To do this, they require further capital; and in their Bill they asked Parliament to grant them £60,000, with the usual borrowing powers. They also sought permission to acquire a new site; and this is also essential in view of the confined environment of the present works, which are situated in the heart of the town. The fight before Sir Saville Crossley's Committee raged round the suitability of the site selected; the Council suggesting an alternative one. We cannot presume to act as judges of the relative merits of the sites from the gas-making point of view. But really anyone knowing the town cannot help feeling a little sympathy for the views of the Local Authority, who have been spending money in the beautifying of the place. From the sea front the town rises up its main street by a fairly steep gradient to the railway station, and continues uphill beyond. The Company's proposed site is situated within a couple of hundred yards of the railway station; and the first thing that visitors will see on arriving in the town, and the last thing they will see on leaving it, will be the new gas-works—if they are erected there. Then, standing in such an elevated position, the people in the residential district beyond the station, if they have any æsthetic sensibility, will not find that the gas-works altogether beautifies the landscape lying below them; and if our recollection of the site serves us right, many people on the slope towards the sea will be of the same mind. Gas-works are not exactly the kind of things that bring delight to the soul of man. All this Mr. Ernest Moon, one of the legal advocates for the Company, will probably regard as twaddle; the people of the town, who are most interested, think otherwise. But in his great wisdom, Mr. Moon, at the twelfth hour of the proceedings, grasped at a straw, or rather at a belt of trees, which probably saved the Company's site, and, it is believed by Mr. Moon, will relieve other people from an offence to their sight. In his closing address, he suggested that the new works should be girdled with trees, and that for the present, until the trees have grown in stature and beauty, the Company should only erect one "storey" to their plant instead of two. The Committee saw a conspicuous sapiency in this proposal; and so, in private consultation among themselves, they improved upon it. They decided that the gas-works should on two sides be screened by a belt of trees planted on a strip of land 30 feet in width; and they considered that—here is the more humorous point for everybody excepting the Company—the gasholders should not, for a period of ten years, be erected more than 20 feet above the soil. They evidently know nothing about capital and site economy in connection with gas-works construction; and it is a point the Gas Company will no doubt think over very seriously. However, the Committee cut one-third off the capital requirements of the Company. There is every probability that the fight will be carried into the Lords. If it is, and the Company succeed, it will be interesting to watch the development of the new works under this extraordinary decision. There is one thing that the people of Broadstairs may be prepared to find, and that is that the gas-works will grow faster than the trees.

A Breach of Confidence. If there is one thing more than another that is scrupulously observed by parliamentary hands—legal and expert—it is an honourable regard for all matters that have passed in confidence previous to appearance before a Committee. There was a breach of this unwritten moral canon in connection with the Broadstairs Bill; and to us, who espouse the cause of companies whenever it commends itself, it is a matter for regret that what, to our mind, was a palpable piece of unfairness, was of the Company's (or their representatives') making. It was an incident that should not be passed unnoticed, as publicity may do something towards preventing its repetition. It had its origin in this way: Mr. W. A. Valon, as Consulting Engineer, has a pretty extensive practice in the south-east of the country as an adviser in engineering matters; and the good people of Broadstairs have frequently sought his services. This being the case, the District Council of Broadstairs retained him in connection with the Gas Company's Bill. After this, on a chance meeting with the Chairman of the Gas Company (Mr. L. Hart), this gentleman asked Mr. Valon to act for the Company; but this, as the latter explained, was, at the time, impossible. After a conference with the members of the Local Authority, in which Mr. Valon explained the position and ascertained their views, he felt that, if he was placed in an advisory capacity with the Gas Company, an amicable arrangement might ensue. He thereupon telegraphed to the Company, stating that there was no longer any obstacle to his acting for them; but the reply he received was not entirely complimentary—seeing that it was the Chairman of the Company (not Mr. Valon) who first suggested that he should appear for the Company. Mr. Valon thereupon continued to act for the Council, and there the matter should have ended. But when he was in the witness chair before the Committee, his telegram was produced; and the Company's legal representative used it as an instrument for damaging the value of his evidence on behalf of the Council. To take advantage of a witness in this way, over what was an essentially confidential negotiation, was unfair in the extreme. We have never met with a parallel incident in connection with Committee proceedings on Gas and Water Bills; and, for the sake of the honour of Gas and Water authorities, it is to be hoped we never shall again.

Friendly Relations at Bromley. Considering the amicable relations that have for long subsisted between the Bromley Gas Company and the District Council, the latter were not, it seems to us, quite so candid with the former as they might have been, over the subject of the Bill which the Company have in Parliament this year to confer upon them an extension of powers. As recently as the early part of February, we heard from Mr. Alexander Dickson, in his address to the shareholders, that, although the Directors knew unofficially that the Local Authority were going to oppose the Bill, they had had no official information from them as to the purpose or grounds of the opposition. The Council were certainly not well-advised in holding aloof from the Company in this way; and we do remonstrate most emphatically against such unmerited treatment, which in itself was sufficiently aggressive to menace a

continuance of the existing amity. However, that is now a matter of the past; and the Company will proceed to work as before on the most cordial of understandings with the District Council. At the same time, the simple concessions which the Council finally asked when the Bill had actually come before Sir Saville Crossley's Committee last Tuesday, and which the Company were able to readily comply with, justify the little protest made here. The Bill did not raise any novel points. The Company merely asked for authority to convert their capital, to raise £150,000 of additional share capital and one-third loan, to empower them to give the consumers and employees the first offer of capital, and to make the sliding-scale operate half yearly instead of annually. They also sought power to apply for an Electric Lighting Order, should the occasion ever arise. In connection with most of the matters, the clauses are drafted on the same lines—in fact, are *ipsissima verba*—of those which have appeared in Bills dealing with the same subjects during recent sessions. Mr. Claude Baggallay proved to the Committee that the Company were compelled to now approach Parliament for further powers, and he made clear the dutiful way in which they have exercised the powers with which Parliament had previously invested them. While Counsel had been explaining the provisions of the Bill, the parties had been conferring; and terms were arranged. By the agreement, the capital was reduced from £150,000 to £100,000; the auction clause was extended to debenture capital; the clause as to the supply of gas in bulk within or beyond the limits of supply was withdrawn; the clause empowering an application to be made for an Electric Lighting Order was deleted; and the Company consented to the provision of a testing station at the Company's new town offices. The whole of these points the Directors felt they could readily concede without detriment to the Company—the chief effect being that it will bring the Company to Parliament again earlier than would otherwise be the case. The arrangement was a prudent one. Had the fight been continued to the Lords, expenses would have mounted up, and, in all probability, these very concessions would have become compulsory requirements by one or other of the Committees. Besides which, it is better far to come to Parliament a little more frequently than usual, if by so doing friendly relations can be maintained with the authorities and people upon whose good will gas companies are to a large extent dependent for their prosperity.

Undefined Limits of Supply. The West Ham Gas Bill has raised a point which it will be well for gas companies to note. In the Company's old Act of 1856, the limits of the district are defined as including certain places and "suburbs and vicinities and parts adjacent." The Company are now asking Parliament for authority to convert their existing capital and to raise additional capital. The Barking and Ilford Gas Companies fear that the Bill will provide the promoters with the means for extending their operations under the vague terms defining their area of supply, and this extension might mean the invasion of the Barking and Ilford territory. They therefore petitioned against the Bill; and the Court of Referees considered their claims to be heard last Tuesday. The decision was that the Bill, having nothing to do with the question of limitations, the *locus standi* of the two Companies must be disallowed. Mr. Claude Baggallay, who appeared for the West Ham Company, made a suggestion to the Barking and Ilford Companies, which perhaps, in view of the greater monetary powers the promoters are likely now to possess, they may think worthy of a little consideration. Mr. Baggallay said the West Ham Company was the first Company there—the Barking and Ilford Companies having come into the district subsequently; and if they wanted the limits of supply defined, it was for them to bring in a Bill for the purpose. One never knows what may crop up under such vague conditions; and—while we do not suppose the large Company would do anything unfair—for small companies it is a little uncomfortable to know that there is a weakness in their territorial rights.

Shepton Mallet Settlement. Acting under the advice of Mr. Corbet Woodall for the Gas Company and Mr. W. A. M'Intosh Valon for the Local Authority, the Shepton Mallet Gas Company and District Council have come to terms over the Bill of the former, without going before the Committee to whom the measure had been referred. It has been arranged that the standard price of gas shall be 4s. 2d. per 1000 cubic feet (instead of 4s. 6d.), with an illuminating power for the gas of 14 candles. In the clause in which the Company shield themselves against penalty in the case of deficiency in the supply through unavoidable cause, the words "or was of so slight or unimportant a character as not materially to affect the value of the supply" have been deleted. The excision will be appreciated without further explanation. The Company are given power to apply for an Electric Lighting Order, but, "not without the concurrence of the Shepton Mallet Urban District Council by resolution conveyed to the Company in writing under the hand of their Clerk." The Company had claimed 5 per cent. on capitalized profits of £4250, but they consented to reduce this to 3 per cent. The additional capital asked was also cut down from £10,000 to £6000, with one-third borrowing powers. The Company have agreed to pay £105 towards the Council's costs. The arrangement between the parties is a very sensible one.

Omagh Gas Purchase. It will be remembered that the struggle in both Houses last year over the Omagh Gas Company's Bill resulted in power being reserved to the District Council to purchase the gas undertaking. The Council have promoted a Bill in the present session to give effect to that power; and the measure, being unopposed, is romping through. At the same time, the proposals have received a good deal of consideration, not only by the Irish office, but by Lord Morley. The principal alterations so far made are that the maximum price of gas is to be reduced from 5s. to 4s. 6d. per 1000 cubic feet; and the fifty years that was sought for the repayment of loan and interest has been cut down to forty years. With these two changes, the Bill is likely to proceed uninterruptedly.

Company and Corporation. A very simple arrangement before Sir Saville Crossley's Committee wiped away obstacles to the progress of the North Warwickshire Water Company's Bill; and, looking at the very fair offers made to the Corporation of Coventry when before the Committee, it seems clear that the opposition have taken the most expensive route to arrive at their present destination in their relations with the Company. The Bill is constituted of various purposes. The promoters desired to extend their limits of supply, to construct new water-works, and, above all, to fix upon the Corporation a time-limit within which they are to complete the purchase of a portion of the Company's undertaking after agreeing upon a price or after the award of an arbitrator. This needs a little explanation. The Company obtained power in their Act of 1898, to extend their limits of supply; and the Corporation, in the same Act, obtained the insertion of a clause which provided that, if ever the city was extended into the then added district, the Company should sell to the Corporation so much of their works and mains as were in that particular area. The boundaries of the city have since been pushed out to such an extent that the Corporation are now in a position to purchase; and in fact they have given notice of their intention to do so. The Corporation—and this is rather curious, seeing that no one yet knows what the amount will be—have obtained the sanction of the Local Government Board to the raising of whatever sum may be awarded by the Arbitrator for the works. The Company now asked Parliament to say that the date for completing the purchase should be the last day of the quarter following an agreement as to price or the issue of the award of the Arbitrator. There was a good deal of discussion between Counsel over the point; the representatives of the Corporation (why, it is difficult to see) striving hard to keep open the indefinite terms of the purchase power in the 1898 Act. However, during the luncheon interval, Counsel for the Corporation submitted, in conference, to what was the fair position taken up by the Company; and it was agreed that the Committee should settle the limit of time at the end of which, if the bargain to purchase the portion of the works was not fulfilled, it should be cancelled. The Committee decided that six months (a concession voluntarily conceded by the Company) would be a reasonable time to allow the Corporation. In connection with the Company's new works, the Committee also adopted their suggestion that the Corporation should be protected by a radius of 2½ miles round the Coventry wells—the latter asking for a radius of 3 miles. The fair attitude of the promoters carried them through.

East Worcestershire Water. Sir Saville Crossley's Committee, it will be seen, have got through a fair amount of work since they commenced sitting. In addition to the Bills already noticed as having been subject to their examination, was the one promoted by the East Worcestershire Water Company. The measure contains three main objects: The increase of the capital from £80,000 to £100,000; the legalization of certain extension works at Washingstocks, about the legality of which some doubts at present exist; and the extension of the area of supply. The opponents were the North Bromsgrove District Council; and the real point of their hostility had regard to the pumping operations at Washingstocks—the allegation being that these operations had exhausted, and were still exhausting, supplies hitherto obtained from private wells, particularly in the Bourneheath district. The opponents were not troubled to prove their charges; the Committee being satisfied that the evidence of the promoters' own witnesses proved that the wells had been seriously affected. They therefore passed the preamble of the Bill, upon the Company undertaking to lay mains at their own expense to Bourneheath. This contented the petitioners against the Bill, and they withdrew their opposition.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time: Hamilton Gas Provisional Order Bill
Newcastle and Gateshead Water Bill.

The Duke of Northumberland has petitioned against the Newcastle and Gateshead Water Bill.

HOUSE OF COMMONS.

Monday, March 3.

LONDON WATER BILL.

The debate on the amendment proposed by Mr. Sydney Buxton to the motion for the second reading of the above-named Bill (see *ante*, p. 566) was resumed to-day.

Sir J. B. MAPLE said the Royal Commission, when considering the constitution of the Water Authority, assumed that its number would be 30; and of that total they recommended that 10 should be given to the London County Council. The Water Board now proposed was to have 69 members, of which number the County Council would have a representation to the extent of one-seventh. The Board proposed was to last three years, and, with the election of members of the London County Council in March and of town councillors in November, there would be changes every ten or twelve weeks. This did not seem to be on business lines. The Royal Commission recommended that the Chairman and Vice-Chairman of the Board should be appointed by the President of the Local Government Board; and he was convinced that this was the best course to adopt. As he had proposed in his own Bill, introduced last session, he would pay the Chairman and Vice-Chairman £3000 and £1500 a year respectively, and the Deputy-Chairman, to be nominated by the Board, £500, with £250 to each of the ten members of an Executive Committee, which would be something in the nature of a Board of Directors. He would also allow the ordinary member £100 a year to pay his expenses in going from one works to another. The Directors of the Water Companies at present took £31,000 for their work; and he estimated that it would be done at £14,000 a year less than at present. Unless they had men who would devote themselves day by day and hour by hour to their duties, they would not be able to deal with the water question. As to the financial arrangements, of course the Companies should receive a proper price for their property;

but it should be settled in a businesslike way. His Bill specified that each holder of an interest in a Water Company was to receive as much new water stock as would give him an income equal to what he had been getting. This was right and proper, and easy of settlement. He next suggested that the water stock should be a 3½, and not a 3 per cent. stock, and that the Water Board should have authority to have an overdraft at the Bank of England, so that there should be means of carrying on the business from the first. As operations in the way of connecting the pipes of the different Companies would have to be carried out, and other works effected at an early stage, there should also be power to borrow a sum not exceeding £1,000,000 sterling. Provision should be made, in the interests of the water consumers, against an arbitrary raising of charges, or an alteration of the conditions of service. Then, too, consideration should be given to the case of the Directors, who would be deprived of their income from fees. In this respect, he reminded the House that when the Government took over the telegraphs the Directors of the Companies were compensated. While supporting the second reading of the Bill, he hoped the Government would consent to the proposals contained in his Bill of last year being referred to the Committee who would consider the present measure.

Mr. Asquith said that rarely, in his experience, had a measure of first-rate importance, proposed by a responsible Government, been exposed to such an unbroken fusillade of criticism as this. Personally, he acknowledged that the Bill was a distinct advance on the position hitherto taken up by the Government. It recognized that the supply of water to the Metropolitan area was a matter of public concern, and ought, in some form, to be in the hands of the community; and that the principle of purchase, as distinct from mere public control, should be applied. The Bill also recognized—and this was another distinct advance—that the machinery of the Lands Clauses Act, with a bonus for compulsory purchase, which the practice of arbitrators had annexed to that machinery, was herein applicable, and that a special tribunal should be set up with special directions. With respect to the financial arrangements, he was glad to understand that the Government had an open mind. This being so, he wished to strongly press the suggestion that they should follow the recommendation of Lord Llandaff's Commission, and decide that in the case of every one of these undertakings the valuation should be in cash, so that they might not have a mere transfer of water stock, but might know at the outset precisely what was the value the tribunal put upon the specific undertakings of each Company. They might then be able to pursue the inquiry whether the amount of water stock which was to be allotted to the vendor in exchange for the cash consideration was or was not more than he should receive. Next, he should think it was a truism that, in considering the amount of stock which was ultimately to be issued to the vendor, it should be clearly understood that account would be taken of the better credit of the purchasing authority. As to the authority to whom the transfer was to be made, any statesman accepting the two principles which the Government had adopted, would find himself under the necessity of discovering or inventing an authority fitted for the purpose. What would they look for? There were some obvious and elementary conditions to which any such authority should conform. It ought to be moderate in numbers and manageable in size. It ought to be, so far as they could make it, homogeneous in its composition, and framed on the precedents which legislative and administrative experience in other parts of the country had shown to be successful. It ought to be able from the first to command public respect, and, what was more important, it ought to be directly subjected to popular control; for they would be no better off than before if the substituted body were not a body made directly amenable to the ratepayers and the water consumers. These being the conditions to which such an authority ought to conform, he would go a step farther, and suggest to the right honourable gentleman (Mr. Long) that if the area of water supply actually authorized or possible were coterminous with the area of the County of London, it would be hardly possible to conceive that either he or any other Minister would have looked elsewhere for his authority than to the one municipal body which represented the whole of London, and which was responsible to the ratepayers. He believed no one would dispute this. Was that *primâ facie* presumption displaced by the undoubted fact that the actual area of supply was, to a large extent, outside the boundary of the Administrative County of London? In answering this question, certain considerations presented themselves, some of which were peculiar to London, and some of which were founded on experience elsewhere. The circumstances of London were in some respects peculiar. In the first place, it was obviously impossible that they could break up the supply and the management of the water and hand it over piecemeal to the various Local Authorities which constituted the County or the Urban District Councils for the whole of this immense area. Nothing but chaos, confusion, and waste could result from a scheme of that kind. The other extreme proposal which might be made—namely, that all these bodies, without distinction, should be united into one gigantic amorphous whole to undertake the supply—was an equally ridiculous hypothesis. The moment they introduced the principle of indirect election, they opened the door to the operation of indirect influences and interests, and proportionately, and almost to the same extent, they shut the door on that which was essential to the true and vigilant conduct of business, and on the invigorating sense of direct responsibility. These theoretical reasons were strong everywhere and at all times, and were amply justified in the case of the late Metropolitan Board of Works. He was not an uncompromising or undiscriminating advocate of everything the London County Council did or did not do; but, on the whole, that body was one in which the great mass of Londoners reposed confidence. As regarded the particular question of the water supply, it stood in a very peculiar position, having, ever since 1891, at the invitation of Parliament, investigated the subject. There were two obvious ways in which they might deal with this matter, if they made the County Council the purchasing authority. They might be empowered to supply water to the outlying Local Authorities, leaving to them the task of distribution; or, as the Council had themselves proposed in the later versions of their Water Bill, they might admit on the Statutory Committee, which would have the management of the water undertakings, representatives of the outlying authorities. This was a course which commended itself to public opinion, and which the County Council had expressed their willingness to accept; and this was the course which, according to precedent, it appeared the House ought to pursue. The more he studied the authority to be created by the Bill, the more he was filled with bewilderment and confusion. If the wit of man had been commissioned to devise and put down on paper the most far-fetched, the worst equipped, and least workable body imagination could suggest, it might have equalled, but it could not have surpassed, the proposal of the right honourable gentleman. In fixing on so large a number of members as 69, the Government had flown in the face of the recommendations of every authority which had examined the question. There was no necessity for bringing the Water Board into existence. It had been gratuitously created by the Government, and was viciously constituted on the principle of indirect representation—negativing electoral responsibility and popular control. The proposed Board was unwieldy, and, anxious as he was to see the water undertakings transferred from private hands to a public authority at the earliest possible moment, he thought there was little prospect of the water supply of the Metropolis being more economically or efficiently managed by the new Board than it would by the present Boards of Directors. He suggested that the Committee on the Bill should be given a free hand to deal with any other scheme which might be brought before them.

Sir F. Dixon-Hartland criticized the Bill from the point of view of the authorities who supplied the water to be used for London, pointing out that they were represented on the proposed Board in a way which they ought not to be. In his judgment, the composition of the Board was in this respect objectionable. The Board should be composed of more business men who understood water supply rather than of men who would come entirely fresh to the task. The Government should also take the responsibility of appointing the first Chairman and Vice-Chairman, so as to secure that they were equipped with a knowledge of the work to be undertaken. He also complained that, while nearly the whole of the London water came from the Thames through Middlesex, the Bill had drawn a fancy line through the county, and had dealt with it rather scantily. The Bill would change the rating outside the County of London in a way that would be detrimental to all the counties round. At present, whenever a Water Company took land to make a reservoir, the parish or district immediately lost three-fourths of the rating which they properly ought to have. These and other points he wished to see threshed out in Committee, in order that justice might be done all round and this great question settled once for all.

Mr. C. Hobhouse complained that there was no provision for the representation on the Water Board of the County Councils of Wilts, Oxford, Berkshire, Bucks, and Gloucester, from which a large part of the water supply of London was taken.

Mr. H. S. Samuel said, in supporting the recond reading, he was quite certain he was acting in the best interests of his constituents.

Mr. J. Burns said the Bill was a deliberate attempt to deprive the County Council of its legitimate duties. In regard to the constitution of the Water Board, the Government had flagrantly disregarded the recommendations of their own Commission and of other authorities. A representation of ten members of the London County Council on the Board would be quite inadequate, and was obviously designed to put the County Council in a helpless minority. As to the financial provisions of the measure, he thought they would give the shareholders of the Water Companies more than they were entitled to. The measure would not be a lasting one unless the Committee were allowed a free hand to reduce the Water Board to 30 members, and the County Council were given a majority of representatives upon it.

Mr. Long: With reference to what has fallen from the honourable member who has just sat down, it is only when he comes to practical suggestions or alternatives to the policy of the Government that he finds it difficult to make a case which commands the attention of the House. It is easy to indulge in criticisms and attacks upon any particular proposals; but the honourable gentleman devoted most of his speech to an attempt to convince the House that there is behind the Bill some feeling towards the London County Council, of which I, who am responsible for the Government Bill, am in entire ignorance. I am told that the sole reason for the production of the Bill in its present form is hostility to the Council, and that if it were not for this feeling of hostility the Council would have been given the power to control the water supply. It is idle to waste time discussing opinions of that kind. Honourable gentlemen opposite are welcome to their own opinions as to what motives induced us to produce the measure. On the other hand, we, I think, shall be better employed in giving, as I will do now, as briefly and clearly as I can, the reasons which have prompted us in putting forward this measure as the best method of dealing with a very difficult question. The right honourable gentleman the member for Fife (Mr. Asquith) says there has been only one speech in favour of the Bill made on this side of the House—that of the honourable member for Dulwich (Sir J. Blundell Maple); and he said he was not quite sure whether that speech was in support of the measure or not. I agree with him. But I must remind the right honourable gentleman that altogether eight speeches have been made from this side—four on behalf of the Water Companies, and three giving unqualified support to the Bill. I am not surprised, however, to find that a measure of this kind meets with a great deal of criticism. We hear of what the London County Council would do if they were now dealing with the question. It is a great pity the Council did not arrive at these conclusions a little while ago. They had their opportunity, and did not avail themselves of it; and it is too late now to come forward. The London County Council have tried their hand; and I do not blame them for having failed. Everyone who has put his hand to the work must know how full of difficulties on all sides the question is; and I think it unnecessary that our difficulties should be added to, and our paths rendered more thorny, by these uncalled-for and unjustifiable suggestions regarding proposals made in good faith and without any feeling of hostilty to the Council or the party opposite. Great stress has been laid on the fact that the Borough Councils in London were not elected as Water Authorites. Neither were the London County Council. When that body was created by the Act of 1888, it was not created as a Water Authority for London, nor was it contemplated that it would become the authority. It was not until it obtained, through subsequent legislation, power to promote

Bills in Parliament, that it was so constituted. Therefore, any argument which is based upon the objects for which these Local Authorities were created, if it was to be held to apply to the Borough Councils, equally applied to the London County Council. But I pass that by, and deal with the simple municipal question. We are told that we are casting a slur upon municipal life—that we are putting back the hands of the clock of municipal life. Do honourable gentlemen opposite realize that in repudiating the right of the Metropolitan Boroughs to bear a share in London Government, either in connection with the administration of the water or in other matters, they are denying to these boroughs the rights and privileges enjoyed by every other provincial borough in the country? There are 28 Metropolitan Boroughs, and there is not one which has not a population which, if it were a provincial borough, would entitle it to all the powers and privileges of a county borough. Did Parliament mean anything real when creating the Metropolitan Boroughs? Was it simply to make Mayors and Aldermen that it set up these bodies? If the latter, the attitude of honourable members opposite is justified. But if the Government meant to give new interest and life to London government—to create new centres of local life, and to attract the best men to interest themselves in municipal affairs—then we are entitled to regard the Metropolitan Boroughs as representative of local government in London, and to include them in the constituent bodies which will go to form the new Water Authority. I admit that a Metropolitan Borough is different from a Provincial Borough; but the position of an urban sanitary district outside the Metropolis is in no sense different from that of any other urban sanitary district in the country. They are responsible for the sanitary work of the area; and one of the primary duties of a sanitary authority is to provide its district with water, or to have a share in the provision of its water supply. So far from it being wrong to include those urban sanitary authorities, it would have been wrong to have excluded them from a share in the representation on this new body. With regard to the Metropolitan Board of Works, we have heard much of its weaknesses, but very little of the good it effected in London. We must remember its work in connection with the Thames Embankment, with Shaftesbury Avenue, and the main drainage system of London. I admit the failure of the Board. The Government had, however, to look for a precedent in forming the new authority, and they found none more worthy of respect than the Metropolitan Asylums Board. The very life of the Metropolis was in its keeping; and we know all men speak well of it. With this precedent in view, I think nobody will look at the size of the proposed Water Board as too large. Judging from the debate, the Government must have discovered the happy middle path which is the safe one. While gentlemen opposite said that the Government are handing over the ratepayers to ruin and destruction, I cannot forget the pathetic language in which the honourable member for East Marylebone (Mr. Boulnois) described the forlorn condition of the Water Companies. It is intended that no injustice shall be done between the Companies, who are the sellers, and the London ratepayers, who are the buyers. It is intended that the policy of the Lands Clauses Act shall be incorporated in our clauses, except as to the 10 per cent. for compulsory purchase, and that there shall be a separate Court of Arbitration. To ask the new Water Board to take up the Water Companies piecemeal will be to impose upon it an absolutely impossible task. The "appointed day" must be a part of the purchase scheme; but if this is too soon for the Companies to have their case ready for arbitration, it can be postponed. While the Government stand by the provisions in the Bill relating to purchase and arbitration, they have no intention that the procedure under the arbitration clauses shall be different from that of arbitration under the Lands Clauses Act.

After some further remarks, the closure of the debate was moved by the Chancellor of the Exchequer, and, on a division, carried by 223 to 145. The House thereupon divided on Mr. Buxton's amendment, which was lost by 226 to 140. The Bill was then read a second time without a division.

Mr. LONG subsequently moved—"That it is expedient that the Bill be committed to a Joint Committee of the Lords and Commons, and that a message be sent to the Lords to acquaint them therewith." He said there were several precedents for the course which the Government proposed, and he did not hesitate to say that this was the kind of procedure which he should recommend for the adoption of Parliament in regard to all Private Bills. In this particular case, the Government thought full justice would be done by referring the Bill to a strong Joint Committee of both Houses.

After some discussion, in the course of which Mr. Boulnois urged that the customary usage should be followed, and the Bill be dealt with by both Houses,

Mr. DILLON objected that the proposal of the Government marked the commencement of a new procedure which would inevitably be applied to all Bills of great magnitude. He therefore moved, as an amendment, that the Bill should be referred to a Select Committee of the House of Commons.

Mr. CALDWELL seconded the amendment.

Mr. LONG said he could not accept the proposal. The Government suggested a single instead of a double hearing in the interests of economy—the money of the ratepayers—the people concerned, and the Bill itself. The House divided, when the amendment was lost by a majority of 73. The motion was then agreed to.

Thursday, March 6.

WEST HAM GAS BILL.

On the motion for the second reading of this Bill,

Mr. LOUIS SINCLAIR (Romford) moved, as an amendment, that the Bill be read a second time that day six months. He said it had always been the accepted rule in Parliament that gas, water, and other companies, when undertaking certain works, should define their areas, and what he asked was that the West Ham Gas Company should follow the precedent, and define their area in this Bill. On behalf of Barking and Ilford, he made that request to the Company, in order that West Ham might not enter into competition with those districts. The Company, owing to the fact of being nearer to London, could purchase coal at a cheaper price than Barking and Ilford; and it would be unfair to those districts to allow West Ham to enter into competition with them.

There was no seconder of the amendment; and the Bill was accordingly read a second time and committed.

The honourable member thereupon put a notice on the paper that at the time of private business the next day he would move that the Committee should be instructed to define the boundaries of the West Ham Gas Company's limits of supply, so as to prevent their supplying gas within the limits assigned by Parliament to adjacent gas companies.

The following further progress has been made with Bills:—

Bills read a second time, and committed: Chard Gas Bill, Kent Water Bill, West Ham Gas Bill.

Bill reported: Limpsfield and Oxted Water Bill.

Bills reported, with amendments: Abercarn Urban District Gas Bill, Broadstairs Gas Bill, Bromley Gas Bill, East Worcestershire Water Bill, Fareham Gas Bill, North Warwickshire Water Bill, Omagh Urban District Gas Bill.

The Commercial Gas Bill, the Grand Junction Water Bill, the Kent Water Bill, the London Water (Purchase) Bill, the South Metropolitan Gas Bill, and the West Ham Gas Bill have been referred to a Select Committee, consisting of Mr. Eugene Wason, Chairman, Lord Balcarres, Mr. T. C. Taylor, and Major Kenneth Balfour; to meet to-day.

A Select Committee has been appointed to inquire and report as to the statutory and other conditions limiting the periods for repayment of loans raised by local authorities in England and Wales, whether any relaxation of such conditions is desirable, and whether uniformity of practice can be secured in this matter. The members of the Committee are Mr. Bill, Mr. Brigg, Captain Donelan, Mr. W. Jones, Mr. J. Hutton, Mr. Heywood Johnstone, Mr. Law, Mr. Grant Lawson, Mr. A. K. Lloyd, Mr. M'Crae, Mr. C. Murray, Mr. Nannetti, Sir Albert Rollit, Mr. Runciman, and Mr. Wodehouse.

Mr. Weir, the member for Ross and Cromarty, has given notice of his intention to ask the Attorney-General next Thursday whether he will grant a return furnishing the following particulars: (1) Of the number of writs issued by the Courts (*a*) at the instance of the Incandescent Gaslight Company, Limited (now the Welsbach Incandescent Gaslight Company, Limited), against persons alleged to have infringed Welsbach British patents since 1890, and (*b*) at the instance of the Welsbach Incandescent Gaslight Company, Limited, against persons alleged to have infringed the 1893 Welsbach British patent since the 1st day of January, 1901. (2) Of all applications made to the Judges of the King's Bench sitting in Chambers for committal to prison, on the plea of contempt, of persons alleged to have infringed Welsbach British patents (*c*) since 1890, and (*d*) since the 1st day of January, 1901, respectively, and of all orders made thereon, and the names of persons arrested and committed. (3) The numbers respectively of manufacturers of incandescent mantles, and of dealers in, or sellers or users of, such mantles, who have been served with writs, prosecuted, or committed to prison on the plea of contempt in connection with alleged infringement of the Welsbach British patents (*e*) since 1890, and (*f*) since the 1st day of January, 1901.

The following notices of motions for Instructions to the Committee on the London Water Bill now stand upon the paper in the names of the members stated: "That the Committee have power to confine the membership of the proposed Water Board, except in the case of the Chairman and Vice-Chairman, to representatives of the county authorities within the area of supply" (Dr. Macnamara). "That the Committee have power to provide for the compensation being ascertained and paid in manner recommended by the Royal Commission presided over by Lord Llandaff, and to amend and alter the Bill accordingly" (Colonel Lockwood). "That, notwithstanding anything contained in sections 211 and 230 of the Public Health Act, 1875, all reservoirs for the storage of water, and all canals and watercourses connected with water supply, within the area of this Act, which are wholly or partly artificially made or constructed, and all water filter-beds within the area of this Act, shall be assessed to the general district rate in urban districts on the full net annual value of such reservoirs, canals, watercourses, or filter-beds, to be ascertained by the valuation list for the time being in force; and in rural districts the owners of such reservoirs, canals, watercourses, or filter-beds shall, for the purpose of any special assessment made on any contributory place for special expenses, be assessed in respect of the full rateable value thereof, or where no special assessment is made, the owners of such reservoirs, canals, watercourses, or filter-beds shall, for the purpose of any rate levied in any contributory place for special expenses, pay in respect of such property the whole of the rate in the pound payable in respect of houses and other property; and sections 211 and 230 of the Public Health Act, 1875, are hereby repealed so far as the same respectively relate to the assessment to the general district rate in urban districts and to the special expenses rate for contributory purposes in rural districts of reservoirs or of canals or watercourses connected with water supply within the area of this Act which are wholly or partly artificially made or constructed, and of water filter-beds within the area of this Act." (Sir F. Dixon-Hartland.)

HOUSE OF COMMONS COMMITTEE.

Tuesday, March 4.

(*Before Sir* SAVILE CROSSLEY, *Chairman, Mr.* TENNANT, *Captain* JESSEL, *Mr.* SOARES, *and Mr.* BONHAM CARTER, *Referee.*)

BROMLEY GAS BILL.

The object of this Bill, shortly stated, was: To convert the shares of the Bromley Gas Consumers' Company into stock, and to empower the Company to raise additional capital; to make further provision with respect to the Company and their undertaking; and for other purposes.

Mr. BAGGALLAY, K.C., and Mr. HONORATUS LLOYD appeared for the promoters of the Bill; while the opponents were represented by

Mr. Lewis Coward, K.C., for the Bromley District Council, and Mr. Wedderburn, K.C., for the Beckenham District Council.

Mr. Baggallay, in opening the case for the promoters, said that the measure was one of details, and proceeded to give a history of the Company, to demonstrate what the details were. He pointed out that in 1853, a Limited Company was formed, which supplied the district in the neighbourhood of Bromley, in Kent—then a sparsely populated district, but one which, of late years, had become thickly populated, having a large number of residential centres in it. In 1865, the Company was incorporated as a statutory concern. Since that year, only one Act had been passed relating to the Company, and that was in 1879. By the Act of 1865, the district of the Company was described; and power was given to the promoting Company and another Company, who obtained powers to supply a portion of the district, to adjust the district between them, and maintain it so long as the agreement continued. The Courts had held that an agreement had been entered into, though the document had been lost. As regarded three of the parishes, the promoting Company only supplied portions of them. The capital—and this was one of the most important things they would have to deal with under the Bill—authorized by the Act of 1865 was £50,000, entitled to 10 per cent. maximum dividend, and £20,000 entitled to 7 per cent.—making £70,000 share capital. The Act authorized a loan capital equal to one-fourth of the share capital—viz., £17,500. By the Act of 1879, additional share capital was authorized to be raised to the extent of £100,000. To this a 7 per cent. standard dividend was attached; and by the Act, a sliding-scale was applied to the additional capital to be raised under the measure, and also to the share capital raised under the Act of 1865, for the purpose of which the 10 per cent. and the 7 per cent. maximum of the 1865 Act then became standards. So that all the ordinary capital was then sliding-scale capital, and the capital to be raised under the Act of 1879 was to be raised subject to the two classes; and it had been so raised. The loan capital raised by the Act of 1879 was, again, one-fourth of the share capital authorized—namely, £25,000 in addition to that previously authorized. So that they obtained a total authorized share capital of £50,000 of 10 per cent. standard, £120,000 of 7 per cent. standard, and £42,000 loan capital. The whole of the £120,000 was not, in fact, bearing dividend, although it had all been raised, because a considerable portion of it represented premiums, which did not carry dividends. The standard price of gas was fixed by the 1879 Act at 4s. 6d. per 1000 cubic feet, and the quality at 14 candles, while a testing-station was provided for at the Company's works. The capital which had been raised was all the £50,000 under the Act of 1865; and it stood now as 10 per cent. standard capital. The whole of the £20,000 authorized by the Act of 1865 had been raised, and stood as 7 per cent. standard capital. The whole of the £100,000 authorized by the Act of 1879 had been raised; but only £62,850 of it bore dividend, because £37,167 was raised by way of premium. Thus the Committee would see that the actual amount of capital raised was slightly in excess—about £17—of what was authorized. This was because the issue of the £100,000 authorized commanded a premium, which brought it just above the amount. The borrowing powers had all been exercised, except £750. That was to say, of the £42,500, £41,750 had been borrowed; and this was represented by £3500 on mortgage and £28,250 of debenture stock. Thus, putting the share capital raised and the loan capital together, they had a total of £211,767. As a matter of fact, the amount of capital expended had been rather larger; there being at the present time an overdraft of £500 on the bankers. The capital expended equalled—he was not sure to a pound or two—about from £830 to £835 per million cubic feet of gas sold. The whole of the capital had been raised except £750. This was the position to-day. It would be proved to the Committee that the works were in good order, and that the Company had ample land, and were in a position, if they had further capital, to carry on their undertaking for many years to come. The principal objects of the Bill were these: The first was to provide for the conversion of the share capital. No doubt the Committee were aware that of recent years Parliament had frequently allowed companies to convert their capital—that was to say, if they had 10 per cent. capital, to double the nominal amount at 5 per cent. There was good reason for this, there being an advantage both to the shareholders and to the consumers. The conversion was proposed to be made under clause 5 of the Bill. The clause would convert the £50,000 of 10 per cent. capital into £100,000 of 5 per cent., and the £82,850—which had dividends bearing, part of it, 7 per cent.—into £165,700 of 3½ per cent. The next object of the Bill was the raising of additional capital, dealt with in clause 11. The amount asked for was £150,000 share capital, with limitations, by clause 26, of dividend—namely, if raised as ordinary capital, it must be raised either at 5 per cent. or 3½ per cent., so as to come into line with one of the two converted stocks, or, if raised as preference capital, to be limited to 5 per cent.—and there was the restriction that the Company were not to raise more than half the capital as preference capital. He would, of course, have to justify by evidence the amount of capital that was asked for. The third object of the Bill was the raising of additional loan capital. This capital, instead of being one-quarter, as under the old Acts, would be one-third of the share capital, which represented a difference in their favour of £14,166, which would bring the total loan capital up to £64,166. The Company, adding this to the new share capital, would have a total amount of fresh capital of £214,166. When they obtained their last Act, in 1879, the make of gas was 76¾ million cubic feet, and it had grown to 266¼ millions last year. It had increased threefold, which was a compound rate of increase equal to 6 per cent. The rate of increase during the past nine years had been 4¾ per cent. per annum. The future requirements of the undertaking the Company had calculated on the basis of a 5 per cent. rate of increase; and on this basis, the powers proposed to be taken under the Bill would last for about twelve years. This, it was contended, was a reasonable period. Further than this, it was proposed, by clause 13, to give the consumers and employees of the Company the first offer of new capital—a system which was amply warranted by experience. Then the Bill would take powers to make the sliding-scale operate half-yearly instead of annually. During recent years, this method had been employed on several occasions, and had been found to work satisfactorily—better, in fact, than the old system. As to the power asked to apply to the Board of Trade for an Electric Lighting Order, the matter was merely a financial one—a domestic concern of the Company. Being a statutory Company, they could not apply for such an Order unless they had statutory authority to spend the money necessary in making the application. All the clause would do would be to provide that it should not be illegal for the Company to devote part of their capital to the purpose, should they desire to make application for an Order to supply electricity. Counsel then went on to deal with the petitions of the two Local Authorities, clause by clause, when

Mr. Wedderburn interrupted the proceedings with an announcement that an arrangement had been arrived at between the parties by which the opposition would be withdrawn, on the following terms: The new share capital to be reduced to £100,000 instead of £150,000; the auction clause to be extended to the debenture capital; and clauses 38 and 39 to be withdrawn—viz.:

Clause 38.—The Company may enter into, and carry into effect, contracts and arrangements with any corporation, local authority, railway company, or any other company, body, or person, within or beyond the Company's limits of supply (but only with the consent in writing of the local authority of and of any company or person authorized by Parliament to supply gas within the district within which the supply is to be given) for the supply to them respectively of gas in bulk, upon such terms and conditions, and for such periods, not exceeding in any case ten years from the making of the contract, as shall be agreed upon, and may, by agreement, vary, suspend, or rescind any such contract or agreement. Provided that the Company shall not supply gas under any such contract or agreement as aforesaid beyond the Company's limits of supply, if, and so long as, such supply would interfere with the supply of gas within those limits.

Clause 39.—The Company, if it thinks fit, may, under the provisions of the Electric Lighting Acts, 1882 and 1888, or any other Act for the time being in force with respect to the supply of electricity, make application for a Provisional Order or license to produce and supply electrical energy for public and private purposes, and may apply its funds for the purpose of such application.

It was also agreed that the testing-station should be at the Company's office, High Street, Bromley, and that the Gas Examiner of the Local Authorities should have access thereto in accordance with the Act of 1871. These conditions were signed by the Chairman of the Bromley Gas Company, the Solicitors to the Bill, and the Chairmen of the opposing Councils.

A report from the Local Government Board was submitted to the Committee, and a long conversation ensued upon it as affecting the following clause:—

Clause 36.—The Company may, if they think fit, allow discounts or rebates, not exceeding in any case 20 per cent., to consumers of gas in consideration of large consumption upon such scale, and subject to such conditions and regulations, as may be prescribed by the Company. Provided that such discounts or rebates shall be of equal amount under like circumstances to all consumers.

The Local Government Board thought that provision should be made for advising all consumers of the discounts which would be allowed to them, and of the conditions on which they would be allowed. The amount mentioned was not to exceed 20 per cent.

After discussion, it was decided by the Committee that the Company should put up a notice in their office from time to time showing the amounts of the discounts, and the conditions regulating their allowance. The amount of the discount was altered so as to read "not to exceed 15 per cent.," instead of 20 per cent. as in the measure.

Mr. *Alexander Dickson*, the Chairman of the Company, gave formal evidence in proof of the preamble of the Bill, which was then passed by the Committee.

An adjournment was taken until Wednesday, to permit of the preparation of new clauses to carry out the agreement arrived at between the parties.

The following is the report on the Bill presented by the Committee to the House:—

With reference to Standing Order No. 188A, the Bill authorizes the promoting Company to raise additional capital; but the usual provisions for the offer of such capital by public auction or tender were varied in the Bill as submitted to the Company, so as to enable the Company in the first instance, with the approval of the Board of Trade, to offer the stock to be sold to the gas consumers and persons in the employ of the Company at as near as may be, but not more than 5 per cent. below the average market price of such stock in the month immediately preceding such offer. A similar variation of the auction clauses is contained in the South Metropolitan Gas Act, 1901; and the Committee, after hearing evidence on the subject, considered that the proposed variation of the auction clauses might be sanctioned.

A report from the Local Government Board relative to clauses 27, 28, 36, and 38 of the Bill had been referred to, and considered by, the Committee.

With respect to clause 27, it was pointed out to the Committee that, under section 28 of the Bromley Gas Act, 1879, a reduction or increase of the standard rates of dividend at a rate of 5s. per £100 was authorized; this being applicable as well in the case of the capital entitled to a standard dividend of 7 per cent. as in the case of the capital entitled to a standard dividend of 10 per cent. Both these capitals are by the Bill converted into stocks, the nominal amount of which is double that of the existing shares; but the relative rights of the existing shareholders are not otherwise altered by the Bill. The reduction or increase provided by clause 27 in the standard rates of dividend upon the new stock has been arrived at first by reducing the rate of reduction or increase authorized by the Act of 1879 by one-half, by reason of the duplication of the nominal amount of capital, and again by reducing it to one-fourth by reason of the reduction or increase below the standard rate being, by clause 27 of the Bill, made applicable in respect of each half year instead of each year, as provided by the Act of 1879. It appeared, therefore, to the Committee that the amendment suggested by the report should not be adopted.

With respect to clause 28, the Committee had made the verbal amendment recommended by the Local Government Board.

With reference to clause 36 ("discounts") of the Bill, it was pointed out that the clause does not provide for the case of discounts in consideration of prompt payment. As regards discounts in consideration

of large consumption, the Committee inserted a provision in the Bill requiring that notice of the effect of the clause should be affixed in a conspicuous place at the Company's chief office. The Committee reduced the maximum amount of discount to 15 per cent.

Clause 38 of the Bill was struck out by the promoters.

There are no other circumstances of which, in the opinion of the Committee, it is desirable that the House should be informed.

COURT OF REFEREES.—Tuesday, March 4.

WEST HAM GAS BILL.

This Bill came before the Court to-day—Mr. PARKER SMITH presiding—in connection with petitions presented by Mr. Granger W. Benning and others, the Barking Gas Company, and the Ilford Gas Company, to be heard against the measure when in Committee.

It was announced at the outset by the Agents for the Bill that they had come to an arrangement with Mr. Benning and others—that they should be allowed *locus standi* as owners of property affected by the erection of the new works proposed by clause 7.

It was stated that the case of the Ilford Gas Company was practically similar to that of the Barking Gas Company; and it was agreed that the arguments and decisions should apply to both cases.

Mr. ERSKINE POLLOCK, K.C., for the Barking Gas Company, denied the allegations of the promoters of the Bill that his Company's petition was simply an objection to past legislation—the West Ham Company's Act of 1856. He did not fear any competition arising under the limitations of that Act; the capital of the West Ham Company being nearly exhausted. But now they sought power to raise £600,000 of further ordinary capital, with the usual borrowing powers for £200,000 more, and to construct new works. If these powers were granted, the position under the existing legislation would be wholly changed. In the Act of 1856, the limits of district were defined as including Walthamstow, Woodford, Snaresbrook, and other places; and then came the vague words "and suburbs and vicinities and parts adjacent." The manufacture of gas under the Act of 1856 was limited to a particular site; and the Company could not construct new works, and could not supply larger districts, without such a Bill as this. They wanted additional authority to lay new mains, and so on; so that, without further legislation in their favour, they would not be able to enter the district of the petitioners. The petitioning Companies were old-established; and in accordance with the now invariable rule of Parliament, they had been compelled to define the boundaries of their area of supply under the Metropolitan Gas Act of 1860. Both were restricted to their present sites. The Bill said that the West Ham Company might hold lands mentioned in Part II. of the Schedule for the construction of new works, the storage of material, and so on, and to supply gas within their limits for the time being. The new works proposed were just on the boundary of the Barking Company; and that Company alleged, therefore, that the West Ham Company would be in a position to attack their (the Barking Company's) interests under their own definition of limits.

Mr. BRYNMOR JONES observed that the Bill did not propose to extend those limits.

Mr. ERSKINE POLLOCK admitted that it did not extend the limits. But he pointed out that there had been an enormous increase of supply in the district; and it was very difficult to say what were the suburbs of Walthamstow, Woodford, and Snaresbrook, and where they ended. In 1856, there was a clear dividing line between these places and the open country which did not exist now; and being their new works, the West Ham Company might extend their operations into the Barking district and far beyond.

Mr. PARKER SMITH: What you mean is that they will have an effective power with their new capital to transgress your limits?

Mr. ERSKINE POLLOCK: Yes; that is just it. It will give them the power of attacking us with a capital more than they have spent between 1856 to 1902. Reading their Act and this Bill together, they would have power which they did not possess under the existing legislation. The Bill would practically repeal the section of the Act of 1856 which gave the Barking Company protection.

Mr. CLAUDE BAGGALLAY, for the West Ham Company, said it was not proposed by the present measure to alter the limitations in their original Bill. They did not seek to extend their limits. Whether the limitations laid down were vague or not, they were what they were; and no question as to these limits could arise now. Should any such question arise, it would be for a Court of Law to decide it. If the Bill were defeated, section 12 of the Act of 1856 would still remain in force; and even if the West Ham Company did extend into the Barking and Ilford districts, Parliament had often given consent to similar overlapping of areas. Such provisions were continually inserted in Gas and Water Bills. Whether it was desirable or not that the limits should be more precisely defined, was a question quite foreign to the objects of the Bill. The present Bill in no way prejudged that question. The West Ham Company was the first Company there—the Barking Company having come into the district subsequently; and if they wanted the limits of supply defined, it was for them to bring in a Bill for the purpose. When the Barking Company said that the limits of the West Ham Company were vague and undefined, they were simply referring to past legislation, and did not at all touch the objects of the present Bill. As a matter of fact, the West Ham Company were not supplying within the Barking Company's district. But that Company had no right to preclude them from doing so; and they had no right to object to the Bill, which was promoted for a wholly different purpose from that. It was quite true that if the West Ham Company ran out of capital they could do nothing anywhere; but the Company had always had the power to go into the Barking Company's district. He admitted that the Bill, if passed, would improve the West Ham Company's chance of exercising competition; but for that they already had authority. The mere fact of exhaustion of capital could not be made the occasion for re-opening the question of powers, or be made the ground for granting *locus standi* against the West Ham Company. The words "within our limits for the time being" provided for the Company's possible extension, and even for the possible curtailment of their limits. The general purposes of the Bill had nothing to do with the definition of limits, but it was to enable the Company to carry on their operations within those limits, whatever those limits might be.

The CHAIRMAN: As there is no competition given by the Bill, we must disallow the *locus standi*.

HOUSE OF COMMONS COMMITTEE.

Monday, March 3.

(*Before Sir* SAVILE CROSSLEY, *Chairman, Mr.* TENNANT, *Captain* JESSEL *Mr.* SOARES, *and Mr.* BONHAM CARTER, *Referee.*)

BROADSTAIRS GAS BILL.

The report of the first portion of the proceedings in the inquiry into this Bill was given last week (p. 568). On resuming to-day,

Mr. *Julian Horrell*, Deputy-Chairman of the Broadstairs Urban District Council, asked the Committee upon every ground to reject the Bill, which, he said, had been thoroughly considered by the Council, and condemned unanimously. If passed, it would be most seriously detrimental to the interests of the town.

Mr. *Hollams*, the Manager of the Grand Hotel, Broadstairs, Dr. *Brightman*, practising in the town, and other witnesses, were called, who gave corroborative evidence as to the injury which would be done if the proposed site were taken for the gas-works.

Mr. *W. A. Valon*, in answer to Mr. HUTCHINSON (for the Broadstairs and St. Peter's District Council), said that, so far as the gas-works were concerned, the site might be a good one; but with regard to the interests of Broadstairs, it was the worst that could possibly have been selected. It was within 200 yards of the railway station, so that it was the first thing seen by visitors on arriving, and the last thing seen on leaving. Although gas-works were conducted fairly free from nuisance, so far as smell was concerned, it was impossible to prevent them from occasionally emitting very strong and objectionable effluvia. Every ton of coals put into the retorts required, when drawn out, water to quench them; and the steam arising must carry with it a great many small particles of fine carbon, which would settle on the houses round about. He had known more than one case where complaint had been made with regard to this.

Mr. HUTCHINSON: It has been said that if another site were chosen the Company would have to re-arrange the whole of their mains.

Witness: That seems almost a ridiculous proposition.

Do you agree that the works could go on for three years without any further expenditure?—Yes.

So far as the rejection of the present proposals is concerned, that would not be at all injurious to the interests of gas-making in Broadstairs?—Not at all; it would be to the good of themselves and the neighbourhood if they were compelled to abandon the proposed site.

Do you consider £80,000 is a reasonable amount of capital to ask for?—No.

The CHAIRMAN: You need not go any further into the question of capital.

In cross-examination by Mr. MOON (for the promoters), witness said he had been in communication with the Chairman of the Gas Company (Mr. L. Hart) with regard to his acting for the Company. Mr. Hart had asked him, at an accidental meeting in the street, to advise them; and he replied that he would be pleased to do so, and said he should counsel the Company to take the Local Authority into their confidence with regard to the Bill. He knew that the Local Authority did not want to go to the expense of opposing; and he recommended Mr. Hart to consider the advantage of accepting the purchase clause, which would be for the benefit of the present shareholders as well as for the future good of the Local Authority. Mr. Hart called on him afterwards, and told him the Directors refused to take the Local Authority into their confidence, and that if he could not advise them without doing that they must go elsewhere. Unofficially, he had spoken to several members of the Local Authority, and they had told him they were sorry he was not to appear for the Company, as they were sure he would act in both their interests. He therefore telegraphed to the Company stating that there was no obstacle to his acting for them, to which he received the reply that they did not think of calling any further expert evidence, but if they did so they would not forget his offer—almost an insult. Witness was also cross-examined at some length upon his views as to the site; but he maintained that it was unsuitable to the district.

Re-examined by Mr. WEDDERBURN: There was no truth in the suggestion that he ever consented to appear in support of the Gas Company in regard to the site. Last year he acted for the Urban District Council, and therefore could not act on a side which might turn out to be against them without having them consulted. In declining to consult them, the Company had acted unusually and unreasonably. He had not consulted the Local Authority at the time he suggested the purchase clause, but had proposed it in order that opposition might be avoided.

Mr. WEDDERBURN then addressed the Committee on behalf of the District Council. He said that, notwithstanding his challenge, the promoters had been unable to show a single precedent for Parliament sanctioning a site to which the local authority and the inhabitants were unanimously opposed. The policy of the Board of Trade, under such circumstances, and where people living in the neighbourhood would not receive compensation, was to refuse to sanction the site. There had been no evidence given, beyond that referring to the site, that additional capital was required; and before the £80,000 was granted, the Committee should be told what was proposed to be spent for the new site, what on the new works, and what for the renewal of the old ones.

Mr. MOON, on behalf of the promoters, confined his remarks to the new site, to the position in which persons within 300 yards of it would be placed if it were sanctioned, and the consent of the Local Authority. He contended that wherever gas-works were placed there would always be opposition, and the question for the Committee was whether the site was a suitable one in the present case. It was known by

Parliament that compensation could not be given for amenities; nevertheless it laid it down thus—that there were cases in which private rights must give way. The need for additional capital was shown by the evidence of the Secretary and Manager, to the effect that the Company had been obliged to refuse applications for an extension of mains simply for want of capital. As the Lloyd Trustees had objected that the site interfered with a proposed road, the promoters would agree to give up half-an-acre at that point. Further, they were prepared, along each side of the new gas-works, for the whole distance north and south, to plant a 30-feet belt of trees, so as to screen the works from view. And as trees did not grow with the rapidity which the objectors would desire, the Company would, for the present, only erect single-lift holders instead of two-lift ones, which would suffice for a number of years to come.

The room was then cleared. On the public being re-admitted,

The Chairman said the Committee considered the preamble of the Bill proved, subject to the conditions that the capital of the Company should be altered from £60,000 to £40,000, and the borrowing powers proportionately reduced, and that the undertaking as to the planting of trees and the cutting-off of the half-acre at the east end of the proposed site should be embodied in the Bill. The Committee further considered that no gasholders should be erected more than 20 feet above the soil.

Mr. Balfour Browne said the promoters would comply with all these requisitions, and bring up the clauses on Thursday.

Thursday, March 6.

The Committee resumed its sittings this morning; and the new clauses were presented and agreed to. By proviso, the scheduled lands were limited in extent (from 3 acres) to 2½ acres, in accordance with the decision of the Committee. Also, in conformity with their decision, it was provided that before commencing the erection of the new gas-works, the Company should, for the purpose of providing a screen, plant a sufficient number of trees on a strip of land 30 feet in width along the north and south sides of the works site. Within a period of ten years, the Company were prohibited from erecting on the scheduled land any gasholder exceeding 20 feet in height above the surface of the ground. In regard to capital, this was limited to £40,000 (instead of £60,000, as asked), of which not more than £20,000 nominal value was to be preference capital. The borrowing powers amounted to one-third of the amount actually raised by the issue of stock in such additional capital. The clause giving power to stop up rights-of-way was struck out.

The remaining clauses were examined by the Committee; and the Bill was ordered to be reported.

LEGAL INTELLIGENCE.

A Granton Gas-Works Contract.

In the Outer House of the Court of Session, on the 25th ult., Lord Low closed the record and ordered proof in an action by Messrs. Wigmore and Co., builders and bricklayers, of Glasgow and Edinburgh, with the consent of George Parker, writer, of Glasgow, and the said George Parker, for his own right and interest, against the Edinburgh and Leith Gas Commissioners. The pursuers state that in October, 1899, Messrs. Wigmore offered to supply the labour for the brick and stone work in the erection of the retort-house, coal-store, and other buildings at the defenders' new gas-works at Granton; the materials to be supplied by the defenders. Their offer, so far as the brickwork was concerned, was accepted; but for the stonework it was not. It was a condition of the contract that they were to be paid in monthly instalments equal to 90 per cent. of the value of the work executed by them, on a certificate by the Engineer at the end of each month; the remaining 10 per cent. to be paid at the end of two months from the Engineer's last certificate, provided the work was to the satisfaction of the Engineer. They had, the pursuers say, considerable difficulty, throughout the whole contract, in obtaining payments on account of the work completed; the work not having been certified by the Engineer monthly, as provided, but only at irregular intervals, in spite of repeated complaints on the part of pursuers. The payments which were made were upon rough measurements by the Engineer, and did not represent the amounts due. The pursuers accepted the payments under protest; reserving their right, upon complete measurements being made, to claim the full amount due to them. In the form of interim payments they had received, up to Nov. 1 last, £2277. The whole work under the contract was completed before that date. They have had the work measured, and have found it considerably in excess of the amount estimated by the defenders; being £3201, of which £2881 ought to have been paid to them before Nov. 1. They sue for £604 as the difference between the sum they have received and that which they claim to be due to them. They also sue for £320 as the 10 per cent. on the contract price, which they claim to be payable to them under the last certificate by the Engineer. By the contract, the brickwork was to be laid in cement mortar composed of one part of portland cement and three parts of clean, sharp sand. Instead, however, of being given sand to make the mortar, the defenders supplied them with breeze. The labour of working with breeze was considerably greater than with sand. By the contract, the defenders were to provide all necessary scaffolding, plant &c.; the pursuers to provide the labour in the erection of it. It was arranged that the scaffolding, when the walls reached a certain height, would be supported upon the roof-girders; but when the time came, the Engineer said it was impracticable, and the pursuers had to erect the scaffolding from the ground, at greater expense. They also did extra work; and for these items they claim £321 3s. 9d. On Nov. 13, they assigned to the pursuer Parker two sums of £300 each of the defenders indebtedness to them; and he concurs in the action. The defenders say that their Engineer duly passed and certified for payment all work executed properly and to his satisfaction, as provided for in the specifications. The measurements by the Engineer do not include additional work.

MISCELLANEOUS NEWS.

THE PRICE OF GAS NORTH OF THE THAMES.

Conference of Local Authorities' Representatives.

Last Friday, a Conference between the Public Control Committee of the London County Council and representatives of the City Corporation and the Metropolitan Borough Councils in the district supplied by the Gaslight and Coke Company north of the Thames, with reference to the charges made for gas in that part of London, was held at the County Hall, Spring Gardens—Mr. A. M. Torrance, Chairman of the Council, presiding.

The Chairman, in opening the proceedings, stated that the conference was called together in pursuance of the following resolution passed by the Council on the 28th of January: "That the Public Control Committee be authorized to convene a conference of representatives of the Corporation of the City of London and the Metropolitan Borough Councils in the district north of the Thames, supplied by the Gaslight and Coke Company, to consider the present high price for gas charged by the Company and matters incidental thereto, and the course to be adopted to obtain a reduction of the price." He said that for the last two or three years this question had been a very serious one, both for the poor people and for the business portion of the community. No ordinary man could understand why there should be a disparity in prices between the north and the south of the river; and yet, notwithstanding all that had been done in the way of agitation, practically nothing had resulted. He trusted that the outcome of the present meeting would be that something might be done, and done speedily.

Mr. W. C. Johnson, Chairman of the Public Control Committee of the Council, moved the first resolution as follows: "That, in the opinion of this conference, the price charged by the Gaslight and Coke Company for gas supplied on the north side of the Thames is excessive, and constitutes a serious burden on the consumers of gas for domestic and manufacturing purposes." Speaking historically, he learned on the previous day for the first time that in 1883 London had a very narrow escape from a serious calamity, because in that year the Gaslight and Coke Company proposed to amalgamate with the South Metropolitan Company. They could form some idea from the present state of affairs, what a loss it would have been to London had the project been carried through. It was largely owing to the energy and initiative of those responsible for the management of the latter Company that the charges of the former had been kept as low as they had, if "low" was the right word to use in such a connection. Fortunately, the amalgamation did not come about; but in 1889 the difference between the prices charged by these two Companies was only 3d. per 1000 cubic feet, whereas now it was 7d. The grievance had been a growing one. Notwithstanding many conferences called in London on the subject, and many resolutions passed, nothing effective appeared to have been done. At the present time, consumers north of the Thames were paying upwards of £500,000 a year to the Gaslight and Coke Company more than they would do if they were supplied by the South Metropolitan Company. This was a very serious figure, and showed the urgency of taking action. As to the reasons which the Gaslight and Coke Company gave for their excessive charges, if reasons they could be called—perhaps "excuses" would be the better word—they were set out in the report of a Select Committee of Parliament as a little over 3½d. per 1000 cubic feet for interest, owing to the large amount of obsolete capital, amounting to about £1,500,000, in existence; and the Committee called attention to over-capitalization to the extent of nearly £4,000,000.

Mr. Crole-Rees (Islington) seconded the motion, and it was carried.

Mr. Johnson then moved the second resolution, as follows: "That, inasmuch as the management of the Gaslight and Coke Company was condemned by the Select Committee of 1899, and the Company have not complied with the recommendations of that Committee, and there is no immediate prospect, under existing conditions, of any substantial reduction in the price of gas, this conference considers that Parliament should be asked to forthwith intervene to protect the consumers from the present monopoly." He said that in the report of Mr. Cardwell's Committee in 1867, they found some words rather foreshadowing the difficulties the consumers had to deal with in this matter. Parliament recognized that it would not do to leave them to the tender mercies of those Companies merely when they brought Bills before the House to be passed. They considered that other remedies should be adopted; and he thought that all consumers north of the Thames would agree with the conference that the time had come when some such remedy should be found. The apparent remedy—namely, the introduction by the Company of Bills into Parliament for the raising of fresh capital—appeared, in the case of this Company, to be likely to be postponed for some time; the avowed policy of the Company being to keep away from Parliament as long as possible. He hoped Parliament would, at the request of the authorities in the area supplied by the Company, take a stronger view of the situation, and intervene to protect the consumers.

Mr. G. Horne (Finsbury) seconded the motion.

Mr. Crole-Rees thought they ought to go to Parliament, as representing the whole of London, and demand their rights, which up to the present time they had absolutely failed to get. They ought to force the hand of the Gaslight and Coke Company, as this was the only way to bring them to their senses.

Mr. A. C. Morton said he was glad to be present, as representing the City; but he failed to see the object of the conference. Apparently they were only going to do again what the Corporation did in 1900.

Mr. Whiter (Hackney) reminded Mr. Morton that in 1900 the Local Authorities in London, apart from the London County Council and the Corporation, were Vestries. They met now as Borough Councils—entirely different bodies.

Mr. Morton pointed out that the resolutions passed at the conference held at the Guildhall were taken up to the Court of Common Council and unanimously confirmed. The City was willing to join in going to Parliament to get the remedy desired; and he thought it was very

inadvisable to attempt to cut the City out altogether, as the resolution appeared to do.

Mr. JOHNSON said there was no intention of slighting the Corporation. The London County Council had appealed for their support.

The CHAIRMAN stated that if it was the desire of the Corporation to join the Council in promoting a Bill, the Council would agree. There was not the slightest doubt that unless they were united in this matter they would do very little good.

The resolution was then put, and carried unanimously.

Mr. JOHNSON next moved the third resolution, as follows: "That, having regard to the urgency of the matter, and the attitude of the Government in respect of the Gaslight and Coke Company's Bill of last year, the President of the Board of Trade be asked to receive a deputation, consisting of one member from each authority represented at the conference, with a view to the Government either initiating or supporting legislation on the subject."

The CHAIRMAN said he had received notice of the following amendment from Alderman TRENNER, of Holborn: "That, inasmuch as three years have elapsed since the Select Committee of 1899 reported that the time had come when a reduction of the standard price might fairly be recommended, this conference earnestly requests the President of the Board of Trade to introduce a Bill into Parliament at the earliest possible moment to give effect to the recommendations of the Select Committee."

Mr. JOHNSON said there were two differences between the motion and the amendment. The first was that the former suggested that a deputation should be sent to the Board of Trade, whereas the latter merely said that the conference "earnestly requests" the President of the Board of Trade to introduce a Bill into Parliament. The resolution asked the Government merely to initiate or support legislation on the subject. It was quite possible that the Board of Trade would not be willing to introduce such a Bill as they required, but would give it some support, or possibly the benefit of their neutrality. From this point of view, he thought the resolution of the Public Control Committee was rather better than the amendment. He was very anxious that the conference should not consider that the Committee were in any way attempting to force down their throats a cut-and-dried scheme; and he was also very desirous that these proceedings should, if possible, be unanimous.

Mr. SQUIRES seconded the resolution.

After some remarks, the amendment was carried, with the addition that the President of the Board of Trade should be asked to receive a deputation.

Mr. JOHNSON moved the following resolution: "That, in the event of the Government being unwilling to promote legislation for the redress of the consumers' grievance, this conference requests the London County Council to introduce a Bill into the next session of Parliament for the purpose of securing, either by revision of the present sliding-scale arrangements or otherwise, a substantial reduction in the price of gas supplied by the Gaslight and Coke Company north of the Thames." He said that, in view of the remarks of Mr. Morton, the County Council were most anxious to work in harmony with the Corporation, and had no desire to thrust themselves forward in opposition to the City. He agreed that legislation introduced by the Council and the Corporation, or by the Borough Councils of London generally, would possibly be better than that introduced by the President of the Board of Trade. They would bring in a better scheme for dealing with the Gas Companies than probably the Government would do. But, on the other hand, they must recognize that the Government were more likely to carry their scheme, if they were attacking a vested interest in the way that they would have to attack it. With regard to the revision of the present sliding-scale, of course it would mean a reduction of the standard price from 3s. 9d. to 3s. 3d., and it would also mean a secondary sliding-scale—namely, allowing the Companies to pay the extra ¼ per cent. dividend for each complete 3d. of reduction below the standard price, and decreasing their dividend by ¼ per cent. for each complete 3d. they went above the standard. The South Metropolitan Gas Company had adopted the secondary sliding-scale, with a slight modification, but the same principle; and this was one of the means suggested by the Bill of the County Council if the conference asked them to introduce one to get a reduction of price. The Gaslight and Coke Company, with their enormous area, capital, and sale, would have to supply consumers at about 7d. per 1000 cubic feet less than they were doing at present; and really they were making next to no profit now.

Mr. STRAUS seconded the resolution; and, after some discussion, it was adopted with the amendment that the Corporation should join with the Council in promoting a Bill.

The next resolution was as follows: "That, in any proposed legislation, provision should be made for the transfer by agreement, or in default thereof by arbitration, to the South Metropolitan Gas Company, of the portion of the area of the Gaslight and Coke Company which is situated south of the Thames, subject to some equitable arrangement being made as regards the charge for gas supplied for public lighting in the Company's district north of the Thames."

A long discussion ensued, and ultimately the motion was rejected, and the following resolution, adopted at the conference held at the Guildhall on Oct. 31, 1900, substituted for it: "That the advantages secured to the Local Authorities on the north side of the Thames by the City of London Gas Act of 1868 and the Amalgamation Scheme of 1883 as to he supply of gas for public purposes should not be interfered with."

The *agenda* for the conference contained the following paragraph: "Letter from the Metropolitan Borough of Finsbury, asking that their delegates may be allowed to raise the question of the clause in the South Metropolitan Gas Company's Bill, seeking power to keep alive the right of purchase by the Company of the Gaslight and Coke Company's southern area, which was subject to the latter Company promoting a Bill in the present session for new capital powers, such Bill not having been introduced." It was stated, in regard to this matter, that the South Metropolitan Company had officially intimated that clause 17 of their Bill now before Parliament, dealing with this subject, would be withdrawn on the Committee stage being reached. The item was accordingly not further discussed.

The proceedings closed with a vote of thanks to the Chairman.

PROVINCIAL GAS AND WATER COMPANIES.

We continue to-day our reports of meetings of Gas and Water Companies in different parts of the kingdom.

GAS COMPANIES.

Bath.

It was stated in the report submitted at the recent meeting of the Bath Gas Company, that the gas-rental showed a decrease for the past six months; but this was accounted for by the reduction of 2d. per 1000 cubic feet made in the price of gas on July 1. There was an increase in the quantity of gas supplied over the corresponding period of the previous year. The receipts for the half year amounted to £41,651, and the expenditure to £33,932; leaving a balance of £7719 to be carried to profit and loss account. Out of this, the Directors recommended the payment of the maximum dividends. While the cost of coal was less during the six months, this had unfortunately been followed by a corresponding decrease in the price obtained for coke.

Dover.

At the half-yearly meeting of the Dover Gas Company on the 3rd inst., the accounts presented showed that the sale of 118,224,100 cubic feet of gas in the six months ending Dec. 31 produced a net revenue of £17,765, and that the total receipts were £24,891. The expenditure for coal and oil was £12,014, and the town dues amounted to £671. The expenses of manufacture were £16,884; of distribution, £1973; and of management, £979—the total being £21,042. The balance carried to the profit and loss account was £3849; and the sum available for distribution, £2954. This was sufficient to pay the full statutory dividend at the rate of 7½ per cent. per annum, less income-tax; and the Directors recommended that this should be done.

Farnworth and Kersley.

The report and accounts submitted at the recent meeting of the Farnworth and Kersley Gas Company showed that the total receipts on revenue account for the six months ending Dec. 31 amounted to £11,143, and the expenditure to £9044—leaving a balance of £2099 to be carried to profit and loss account. It was stated that the reduction obtained on the last coal contracts had increased the amount of profit earned; and the Directors were confident that a still further reduction would be secured at the termination of the present contracts. No alteration had been made in the charges for gas, to meet the recent excessive increase in the cost of coal; the selling price having been maintained at 2s. 4d. and 2s. 8d. per 1000 cubic feet. The usual dividends were declared.

Gloucester.

The Directors of the Gloucester Gas Company report favourable progress; the consumption of gas still being on the increase. Since the last meeting, £5000 of new consolidated stock has been sold by auction, realizing £5814 10s. The net profit for the half year, after deducting interest on mortgages, &c., was £4761, which, added to the amount brought forward from last account (£1226), made the amount available for dividends £5987. Out of this the Directors recommended the payment of the statutory dividend of 5 per cent. per annum upon the ordinary stock. This would absorb £4231, and leave a balance of £1756 to be carried forward.

Harrogate.

At the recent half-yearly general meeting of the Harrogate Gas Company, the accounts presented showed that the revenue from the sale of gas in the year ending Dec. 31 was £34,048; residuals brought in £10,608; and the total receipts were £47,932. The expenditure on the manufacture of gas was £31,596; on distribution, £1724; and on management, £1988—the total outlay being £37,286. The balance carried to the net revenue account was £10,646. The amount available for distribution was £7593; and the Directors recommended the payment of the usual dividends. Under the supervision of the Works Manager (Mr. G. S. Sayner), 24,471 tons of coal and 23 tons of cannel were carbonized last year; and the make of gas was 246,359,800 cubic feet, of which 233,546,100 cubic feet were sold, and 237,752,000 cubic feet accounted for. The Chairman (Mr. S. Hornby), in moving the adoption of the report, while expressing regret that there was a diminished profit as compared with the year 1900, owing chiefly to the additional expenditure on coal, congratulated the proprietors upon the fact that, notwithstanding the mildness of the weather in the early part of 1901, followed by the Harrogate season commencing very late, the gas consumption had increased by 3¼ per cent. He referred to the gross price of gas having been reduced 2d. per 1000 cubic feet as from the beginning of the year, and expressed the hope that the Directors might shortly be in a position to announce a further reduction. The report was adopted.

Hastings and St. Leonards.

The accounts presented at the meeting of the Hastings and St. Leonards Gas Company last Thursday showed that in the six months ending Dec. 31 the gas-rental amounted to £32,640, which was less than in the corresponding period of 1900, owing to the reduction of 4d. per 1000 cubic feet in the price of gas—bringing it down to the old figure of 3s. The total revenue was £43,294; and the expenditure, £33,881, of which £19,848 was for coal, oil, &c., and £1948 was coal duty paid to the Corporation. The balance carried to the profit and loss account was £9413; and the sum available for distribution was £50,591. The Directors recommended the payment of the statutory sliding-scale dividends at the rate of 6½ per cent. per annum on the converted 5 per cent. stock, and of 5 per cent. per annum on the 3½ per cent. converted stock, both less income-tax. Under the supervision of Mr. Charles E. Botley, M.Inst.C.E., the Company's Engineer and Manager, 16,299 tons of Newcastle coal, 72 tons of cannel, and 153,912 gallons of oil were employed in the production of 222,491,000 cubic feet of gas, of which 54,329,000 cubic feet were oil gas. Of the entire make, 210,427,600 cubic feet were sold, and 212,652,500 cubic feet were accounted for.

Ilfracombe.

From the accounts presented at the annual meeting of the Ilfracombe Gas Company last Wednesday, it appeared that there was a

disposable balance of £2748, out of which it was decided to pay the statutory dividends of 5 per cent. on the preference stock and 5 per cent. on the consolidated ordinary stock. The number of consumers had increased by 118, and of cookers by 74. It had been determined by the Directors to again reduce the price of gas in June. Moving the adoption of the report, the Chairman (Mr. R. Lake) referred to the loss sustained by the Company in the death of Mr. T. D. Wivell, the late Chairman. In view of the introduction of electric lighting and the present high price of labour, the further extension of the works would be deferred, though the Directors really thought that the electric light would make no difference to the Company. The report was adopted.

Leominster.

According to the accounts presented at the half-yearly meeting of the Leominster Gas Company last Thursday, the sale of 22,193,100 cubic feet of gas in the twelve months ending Dec. 31 produced a revenue of £4522, and the total receipts amounted to £5961. The expenditure was £4906; and the balance carried to the profit and loss account was £1055. The Directors recommended dividends at the rates of 10 and 7 per cent. per annum on the original and "B" shares respectively. In their report they stated that the increase in the consumption of gas, by private consumers only, in the year had been 1,967,500 cubic feet, or at the rate of upwards of 9½ per cent. on 1900. This was partly due to an increase in the number of slot meters, of which about 60 were sent out during the year; and the demand for them continued. The report was adopted.

Lewes.

The report which was adopted at the meeting of the Lewes Gas Company last week stated that the revenue account for the six months to Dec. 31 showed a profit of £1336; and after providing for interest on mortgages, the balance of net revenue was £3102. The Directors recommended that dividends be declared at the rate of 5 per cent. on the original capital stock, and 3½ per cent. on the additional capital stock. These dividends, after deduction of income-tax, would absorb £1397, and leave a balance of £1704 to be carried forward to the next accounts.

Londonderry.

At the ordinary general meeting of the Londonderry Gas Company last Tuesday, the Chairman (Mr. W. Tillie) had the pleasant duty of proposing a dividend of 11 per cent., free of income-tax. In moving the adoption of the report, he said the past year's business had been prosperous, though the Company had been working at considerable disadvantage, especially in regard to the price of coals and other materials. However, they had only to draw upon the surplus to the extent of about £200. The Directors were about to make an effort to improve the manufacturing appliances. The works had been examined by an expert, and, acting on his advice, they had almost completed their scheme, and intended to push the improvements forward during the spring and summer, so as to have them in readiness for next winter. An installation of water-gas plant was an important item of their scheme. The Directors had visited the Belfast Gas-Works, and had received a great deal of valuable information from Mr. Stelfox; and, as a result, they were now well abreast of what was the best opinion on this subject. The most important matter was the renewal of the retorts. Acting on expert advice, they were arranging to put in retorts on the latest principle—such as were being erected in Edinburgh and other towns in England and Scotland; and they hoped by this means to be able to produce cheaper gas. The motion was carried unanimously. Votes of thanks were accorded to the Secretary (Mr. J. Macnie) and the Manager (Mr. R. J. Skinner), whose services to the Company were highly spoken of. At the close of the ordinary business, a special meeting was held at which authority was given to the Directors to raise new capital to the extent of £24,000, and to borrow £6000, for the general purposes of the business.

Riddings District.

The revenue of the Riddings District Gas Company, of which Mr. Charles Horsley is Chairman, in the six months ending Dec. 31 last was £2794, of which £2370 was derived from the sale of gas. The expenditure being £1969, the balance carried to the profit and loss account was £825. The sum available for distribution was £2988; and the Directors recommended the declaration of a dividend at the rate of 7 per cent. per annum, free of income-tax. This was agreed to at the half-yearly meeting.

Rushden and Higham Ferrers.

The annual meeting of the Rushden and Higham Ferrars Gas Company was held last Friday—Mr. E. Claridge (the Vice-Chairman) presiding. The balance-sheet having been approved, the Secretary (Mr. G. S. Mason) submitted the Directors' report, in which they testified to the continued satisfactory progress of the Company. The quantity of gas sold during the past year showed an increase of 13 per cent. on that of 1900; the gross sales realizing £11,600, against £10,500, notwithstanding the reduction of 2d. per 1000 cubic feet in the price at the commencement of the year. The increase of business by means of prepayment meters was very marked; the total revenue from this source during the year amounting to upwards of £3000, or £700 more than in the previous year. Owing to the high price of coal during the first half of the year, the total profits amounted to £3052, against £3549; the difference in the price of coal amounting to no less than £1400. The profits were, however, amply sufficient to pay a dividend at the standard rates, and also to provide a first instalment towards a reserve fund account. The Directors therefore had no hesitation in recommending the shareholders to declare a dividend at the standard rates of 10 and 7 per cent. per annum on the original and additional stock respectively, less income-tax, and also that a sum of £200 should be carried to the credit of a reserve fund account. The Directors felt justified in reducing the price of gas 1d. per 1000 cubic feet as from the 1st of January last. They were satisfied that the works and plant of the Company were kept in a high state of efficiency, and they again expressed their feeling that the Company were indebted to their Engineer and Manager (Mr. Thos. Watson) for his great care of their interests. The report was unanimously adopted. Among the votes of thanks accorded was one to Mr. Watson, whose careful management of the works was commented upon.

Sevenoaks.

The report presented at the recent annual meeting of the Sevenoaks Gas Company stated that the accounts for the past half year showed receipts of £8313, and an expenditure of £6244. This left a profit of £2069, which, added to the balance brought forward, gave £4825 available for distribution. They recommended the payment of dividends at the rate of 10 per cent. per annum on the original capital and 7 per cent. on the additional capital, less income-tax. The Manager (Mr. W. J. Dougall) stated that several hundred yards of new mains had been laid in the district. The Chairman, in moving the adoption of the report, said that it must be most gratifying to them all that such a statement should be made in spite of the difficulties they had to contend with. They had been able to reduce the price of gas to 3s. 8d. per 1000 cubic feet. During the past half year, they had made something like 2½ million cubic feet more gas. The slot meters and cookers had also increased in numbers, and were appreciated by the public. They had extended their mains to Dunton Green. The report was adopted, and the dividends declared.

Sittingbourne.

The annual meeting of the Sittingbourne Gas Company took place last Tuesday—Mr. R. Chapman presiding. The profit and loss account showed a balance available for dividend and interest of £4178; and a dividend of 8½ per cent. for the half year ended Dec. 31 was declared. The limit of the authorized capital of the Company (£30,000) has now been reached; and parliamentary powers are to be obtained to increase the amount.

Tonbridge.

The sixty-sixth annual meeting of the Tonbridge Gas Company was held on Monday last week. The revenue account showed a profit of £3340, which, added to the balance of £3516 brought forward, made a total of £6856 available for distribution. The Directors recommended dividends at the rates of 11½, 8½, and 5 per cent. per annum, free of income-tax; leaving a balance of £3819 to be carried to the next account. The Chairman, in moving the adoption of the report, stated that the results of the past year's working had been very satisfactory; for, notwithstanding the fact that the price of coal was 9s. per ton higher for the first six months than during the corresponding period of 1900, and the charge for gas had been reduced from 3s. 4d. to 3s. 2d. at the 31st of March, and from 3s. 2d. to 3s. at the 30th of June, the profit for the year was higher than before. The reduced price of coke had adversely affected the balance on the revenue account. The consumption of gas had increased by 10 million cubic feet, or 16 per cent. He considered the Company's affairs were in a very prosperous condition. The report was adopted, and the dividends recommended were declared. The meeting closed with a hearty vote of thanks to the Directors, as well as to the Manager and Secretary (Mr. James Donaldson), whose salary has been increased by £50 per annum. At the close of the general business, an extraordinary meeting of shareholders was held, to authorize the Directors to issue new stock to the extent of £10,000.

Tynemouth.

The 36th annual meeting of the Tynemouth Gas Company was held last Thursday—under the presidency of Mr. J. B. Williamson. In moving the adoption of the report, the Chairman said they had again had a prosperous and, all things considered, a satisfactory twelve months. The increase in gas made over the previous year was at the rate of 10·04 per cent. In order, however, to meet the dividend, it had been necessary to draw on the balance of profits brought forward to the extent of £1078. This was not to be wondered at, when it was remembered that coals had been abnormally high; that they had already expended more than £20,000 on the new works; and that this large sum had been entirely unremunerative during the greater part of the time. It was, of course, obvious that, with such an enormous expenditure on capital account as the duplication of the works entailed, a large portion of the money so expended must for some time continue to be unproductive, and that it was impossible to work under the most favourable and economical conditions. When all this had been taken into account, there appeared to be every reason to be satisfied with the year's work. When the new works were fully going next autumn, with all the latest appliances to economize both materials and labour, there was no doubt that they would be in the very best position possible to produce cheap gas. They hoped and expected that, with the anticipated reduction in the price of coal, and the better results obtained in the new works, they would soon be able to remove the remaining 2d. which they put on the charge for gas about two years ago. They had carbonized 35,805 tons of coal, or 3265 tons more than in the previous year. The number of ordinary consumers had increased by 300; but the number of automatic meters fixed had risen from 2176 last year to 4109 this—an increase of 88·83 per cent. They had received for coke about £10,370, or £1656 less than last year, though the quantity sold was about 1300 tons more. Tar receipts were less by £200; and sulphate of ammonia gave £344 more—partly due to the larger make and better prices, and also to a bigger yield per ton of coal. They expected, when the new works were going, and the large and improved new scrubbers were in operation, that the yield of sulphate would be very considerably improved. The report was adopted, and a dividend of 2½ per cent. on the consolidated and new ordinary stock, less income-tax, was declared. An extraordinary meeting was afterwards held, when the Directors were empowered to raise £16,000 of the additional capital authorized by the Act of 1897, or as much as would produce the unsold balance of £75,000 granted by the aforesaid Act.

WATER COMPANIES.

Sevenoaks.

The Directors stated, in the report which was adopted at the half-yearly meeting of the Sevenoaks Water Company on the 3rd inst., that the revenue showed a steady increase. The balance at credit of profit and loss account was £1805, out of which the Directors recommended the payment of dividends at the rate of 10 per cent. per annum on the

consolidated stock and 7 per cent. on the share capital, less income-tax. This would absorb £1437, and leave £368 to be carried forward. In moving the adoption of the report, the Chairman (Mr. Sydney Thompson) congratulated the shareholders on the fact that the steady progress made enabled the Board, for the first time, to recommend the payment of a dividend at the highest rate permitted by the Company's Act, and at the same time to carry forward a substantial balance. The Company were invited in October to name a sum at which they would be willing to sell their undertaking to the Council; and the Directors replied that they were prepared to recommend a sale for £146,000. A Committee of the Council met the Board and submitted a counter offer of £78,270, based on the result of an arbitration between the Hemel Hempstead Corporation and the local Water Company. This offer was subsequently increased to £86,610, which the Council described as 30 years' purchase of the net profit of the year ended Dec. 31 last. The Directors were not able to see that the sum offered was equivalent to 30 years' purchase of the Company's profits, nor that the sum awarded in the Hemel Hempstead case was on any such basis. In arriving at a fair price, there were clearly four items to be considered—viz., payment for existing income, payment for prospective income, compensation in respect of purchase, and compensation to officers and servants. The Sub-Committee of the Council recognized the principle of these payments; but the Directors thought they failed to apply it. The Committee suggested £60,000 as a fair price for the existing income, and £26,310 for the other claims and expenses of liquidation. Now, although £26,310 might have been sufficient for the sundry claims—and he thought on these they might have been able to come to terms with the Council—the balance of £60,000 could hardly be said to be such a sum as would provide the shareholders with "an equally good security producing the same income." The net profits for last year were, after payment of debenture interest, £3057; and he would be glad to know where to get an equally good security for £60,000 providing that amount, or even the amount of their maximum dividend—£2874. Then it was suggested that the stock and share holders should be quite happy if they got 50 per cent. premium for their holdings; and again he would like to know where he could buy stock in a water company paying 10 per cent. at only 50 per cent. premium.

Woking.

The accounts presented at the half-yearly meeting of the Woking Water and Gas Company, on Monday of last week, showed that the capital expenditure in the six months to Dec. 31 was £30,322, which included payments on account of the new works on the Thames at Laleham, and of the remaining portion of the trunk main thence to the district. The revenue was £5108, or an increase of £166 over the corresponding period of the previous year; while the expenditure on maintenance account amounted to £1805, or an increase of £297. The profit for the six months was £2681, as against £2818, or a decrease of £137. Adding to this the balance brought forward (£692), and deducting interest, £497, and income-tax, £148, there remained a balance of £2728. The dividend proposed would absorb £2154, leaving the sum of £573 to be carried to the next account. In moving the adoption of the report, Mr. R. Hesketh Jones, J.P.—who presided consequent on the indisposition of the Chairman (Mr. Charles Horsley, J.P.)—said it might seem possible, on reviewing the balance-sheet for the past six months, and taking into consideration the proposed reduction of ½ per cent. in the dividend, that they were somewhat under a cloud; but he did not think they should look upon the matter in this light. The Board were recommending a less dividend owing to the large expenditure on capital account; and it was but natural that, until this capital outlay became remunerative, the amount divisible among the shareholders would be reduced. The large capital expenditure should not be regarded as an evil, but, on the contrary, as a benefit, and as a permanent advantage to the Company. They had not been able to get a sufficient quantity of water in their district to meet the increased demands that were being constantly made upon them; and therefore, with the shareholders' consent, the Directors had obtained an Act of Parliament, and had gone to the Thames for a supply. It was not peculiar to that Company to be thus placed in a difficulty with regard to obtaining water in their own district. He belonged to Croydon; and he found at the last meeting of the Corporation that they were in the same position—namely, that they could not get sufficient water to supply the increased district which they would have to supply by and by, when the Government Water Bill placed the portion of Croydon now covered by the Lambeth Water Company in the hands of the Corporation. He thought it was pretty well known among shareholders of water companies that during the past six or seven years the rainfall had been so deficient that there really was not the same amount of water in the earth to be pumped out. Consequently, the Company had been compelled to resort to the Thames. With reference to the future, the Directors had very carefully considered the position; and they were economizing the working expenses to a very considerable extent. During the forthcoming year, they would be able to make certain alterations in the annual expenses. The Engineer had kindly proposed to reduce his salary for the next two years; and the collector also had made a little alteration in his percentage. Then there was a probability of their being able to shut down one of their establishments, so as to reduce wages and expenses throughout. Under these circumstances, the Directors looked forward to being able to rub along for the next year or two with a dividend of 4 per cent. Possibly this low rate might not be necessary for more than a twelvemonth—at all events, the distribution would be raised to 4½ per cent. again at the earliest possible date. It would be seen from the balance-sheet that on the present occasion the Directors could have recommended a dividend at the latter rate; but they thought it inadvisable to divide to the full the profits earned. There was another feature referred to in the report—namely, the reduction of revenue consequent on the troops being absent in South Africa. Taking everything into consideration, he thought the position of affairs should not be regarded in a desponding light. The report was adopted, and a dividend at the rate of 4 per cent. per annum, less income-tax, was declared. An extraordinary meeting was subsequently held to authorize the raising of £25,000 of additional capital, as well as loan capital and debenture stock.

AUSTRALIAN GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held on the 30th of January last—Mr. G. J. COHEN in the chair.

The SECRETARY (Mr. R. J. Lukey, J.P.), having read the notice convening the meeting, the report of the Directors, which had been distributed to the shareholders, was taken as read. In the course thereof, they stated that the profits, after making provision for bad and doubtful debts, deducting interest on borrowed money, repairs and renewals, depreciation of plant, working expenses, and all other charges, amounted, with the balance brought forward, to £60,475; and they recommended the payment of a dividend for the six months of 9s. each on the old shares, and in proportion on the new shares, free of income-tax. This would absorb £51,918, and leave a balance of £8567 to be carried forward. The Engineer (Mr. T. J. Bush) reported that the whole of the plant was in excellent condition. The consumption of gas was steadily increasing; and to meet the extra demands in the suburbs of Rockdale, Hurstville, Bexley, and Kogarah, it had become necessary to lay a new 18-inch main from Burwood, involving an expenditure of about £30,000. At Rushcutters' Bay, land had been secured for the erection of a gasholder, to improve the supply in the eastern suburbs. The expenditure for the half year had greatly increased, owing to the high price of coal, the heavy duties imposed by the Federal Government on mains and plant generally, and additional wharfage dues. The accounts accompanying the report showed that the revenue from the sale of gas in the half year was £199,790, while the manufacturing expenses were £121,637.

The CHAIRMAN, in moving the adoption of the report, expressed his pleasure in stating that the revenue for the half year had considerably increased; but, on the other hand, he was sorry to say the expenditure was also exceptionally high, principally owing to the imposition of the Federal tariff and the increased price of coal. The Company had steadily brought down the price of gas without giving any additional dividend to the proprietors; but now the Harbour Board wished to make a large additional charge for wharfage, and only that day he had had placed in his hands a notice from the City Council to assess the land occupied by the Company's mains, which claim they would certainly resist. If they had to make these payments, the only thing they would have to do would be to raise the price of gas. It was true these additional imposts had not yet been made, and he hoped they would not be. In September last, the Board resisted a demand by the Harbour Trust Commissioners of 6d. per ton on the coals landed at the Company's wharves at Sydney and Mortlake, with the result that the Harbour Master stopped the colliers delivering coals at both of these works. An injunction against these proceedings was applied for in the Equity Court, and granted by Mr. Justice Walker, who subsequently tried the case, and gave a decision in the Company's favour. The Commissioners then appealed to the full Court against this decision. The arguments were concluded on the 4th of November; but judgment had not been given. While this was in abeyance, the injunction remained in force, and the coal was being discharged on both wharves without any interference on the part of the Harbour Trust Commissioners. The new capital met with a favourable response. Out of 11,367 shares issued, 10,551 had been taken up. The balance, together with the unallotted shares (in all 816), would be sold by auction. The debentures, amounting to £300,000, floated in London in 1887, would mature in July next, and would probably be renewed at a lower rate of interest, perhaps, in the colony. The show-room, which was destroyed by fire last July, was in course of re-erection, and would shortly be opened. During the half year, there had been an increase of 85 in the number of street-lamps, which now totalled 10,565; and the number of consumers had grown to 53,000. No less than 12,000 of these, or nearly one-fourth, were using "penny-in-the-slot" meters. The use of gas-cookers was extending, the Company having sold 11,214, including 666 in the half year; and as there were now many other firms in the city selling them, probably twice this number were being used. The day consumption of gas was steadily growing, and now represented a proportion of 40 per cent. of the whole. The increase in the mileage of the mains was 70, the total length of piping up to date being 1565 miles.

The DEPUTY-CHAIRMAN (Mr. F. Dickinson) seconded the motion, and it was carried unanimously.

The Directors and officers having been thanked for the efficient services rendered by them to the Company, the proceedings closed.

OTTOMAN GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 9, Queen Street Place, E.C.—Colonel JAMES LE GEYT DANIELL in the chair.

The SECRETARY (Mr. Thomas Guyatt) having read the notice calling the meeting,

The CHAIRMAN said the Directors met the shareholders with feelings not unaccompanied with satisfaction at the results of the half year, inasmuch as the accounts disclosed the fact that the rental showed a record, and not only that, but the profit for the half year and also for the whole year was a record—neither having been attained to a like extent before. When he spoke of profit, it should be remembered that this was in face of the coal used having cost them £1296 more than in the corresponding half of 1900. The profit carried to the balance-sheet amounted to £3369, which, added to the £716 brought forward, gave £4086 for the shareholders to deal with. All of this spoke well for the energy and resource displayed by their Manager in Smyrna (Mr. John Gandon) in availing himself of every opportunity for extending the Company's operations whenever it could be done with profit. Indeed, the Directors could not speak too highly of the advantage the Company had in having such an able Manager. Looking into the accounts, and taking the expenditure on the revenue account first, coal had cost £6769, as compared with £5472 in the second half of 1900. There were only small changes in other items, excepting that of "depreciation, renewals, and repairs," which amounted to £1972, in

comparison with £2274. But in the corresponding period there was a suspense account; and this, as he explained at last half-year's meeting, had been disposed of, and so caused the reduction. On the other side of the account, the gas-rental had increased considerably. The public lighting amounted to £4319, as against £4079; and the general consumers £8674, as compared with £7848. The two items together made £12,993, as against £11,928. Those who were acquainted with the working of other gas companies, would be aware that the residuals in the half year had not helped to swell the profits. In their own case, the receipts under this head showed a slight diminution; but, taking the whole year, there was a small profit. The profit on fittings, meter-rents, &c., showed a valuable advance—being £1172, as against £635, or £537 to the good. Making comparisons of the items in the balance-sheet, it was seen that most of them on the debtor side showed little variation. One of the most noticeable was bills payable £415, as against £2229; the difference being due to a special purchase of coal. On the other side, the investment now stood at £98,600; an addition of £168 having been made in the half year. The item of stock stood at £451 more; and there was also an increase in the amount of the depreciation fund invested in Consols and war loan. Respecting the working, it might interest the shareholders to know that the yield of gas per ton of coal carbonized had been 10,640 cubic feet; and that the total quantity made was 48,900,050 cubic feet. The number of public lamps was 2043, which was in excess of the number under the old contract. In concluding his remarks, the Chairman referred to the suggestion that was made a few years ago when the Articles of Association were altered, of holding an annual meeting instead of half-yearly meetings; but, as one of the shareholders was then rather in opposition to the change, the Directors did not press it. He alluded to the matter now in order that the shareholders might have the opportunity of considering it in the event of the Directors proposing it again at the September meeting. The change would not affect the payment of dividends half yearly; and with the dividend warrants the Directors could send out a statement as to what had been done during the half year. He moved the adoption of the report and accounts.

Mr. Charles Gandon seconded the motion.

Mr. A. M. Paddon, in congratulating the Directors upon the statement they had presented, said it was remarkable to his mind that a record profit and rental should have synchronized with the past year, during which gas companies had been emerging from a period of considerable depression and difficulty. No other company, so far as he knew, had done this; certainly not a company situated as this one was. He spoke in favour of the proposition that the meetings should be held annually instead of half yearly, as he did not think it possible to presen the affairs of a Company like this every six months so as to faithfully reflect its condition and circumstances, any more than it would be possible for a statutory company in this country to present their accounts every three months.

Mr. W. Hughes thought that, if a statement was sent out with the interim dividend warrants, the shareholders might acquiesce in the proposal to hold annual meetings. He also asked whether anything was being done in Smyrna regarding electric lighting.

The Chairman replied that nothing had been done in connection with the supply of electricity. They had now a long concession for gas lighting; and the Company had had to lay out a considerable amount of money to comply with the requirements of the concession. He did not hesitate to say that the time was far distant when electric lighting would obtain a place in Smyrna. Moreover, there was a tremendous demand for incandescent gas-mantles.

A dividend at the rate of 7 per cent. per annum on both classes of shares having been declared,

On the motion of the Chairman, seconded by Mr. H. W. Andrews, the retiring Directors (Mr. Stephenson R. Clarke and Mr. Strachan C. Clarke) were re-elected. The Chairman mentioned that Mr. Stephenson Clarke was still acting as second in command of his regiment in South Africa.

Moved by Mr. J. L. Chapman, and seconded by Mr. F. W. Church, the Auditors (Messrs. T. H. Cooke and A. W. Cooper) were re-appointed.

Votes of thanks to the Chairman and Directors and the officers concluded the proceedings.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 3, Lothbury, E.C.—Sir John Aird, Bart, M.P., in the chair.

The Secretary (Mr. W. B. Peat) having read the notice of meeting, the report and accounts were taken as read. These showed that the receipts for the past year amounted to £26,053; and the expenditure to £14,598—leaving, after the usual deduction for sinking fund, a net revenue of £11,455. The amount available for dividend, including the balance brought forward, was £14,183.

The Chairman—after a reference to the indisposition of the Deputy-Chairman (Sir Frederick Wigan, Bart.), from which, he remarked, they all wished him a speedy recovery—said he was glad to say the accounts were very satisfactory. The Directors ventured, when the shareholders met last year, to express the opinion that this would be so, and most pleased were they to find their expectations had been so completely fulfilled. The Company were one of those who, while doing their best to obtain a fair income, also did their duty to the country in which they invested their capital. Indeed, he attributed their continued great success to the fact that they had throughout not only considered the interests of the shareholders, but had also endeavoured to do full justice to the people of Cagliari, and to act fairly in all matters which from time to time cropped up in connection with the authorities. In regard to the accounts generally, the Directors again recommended a bonus, which was omitted last year; and they were very pleased that the accounts so fully justified its resumption. Respecting the water receipts, there had been an increase; and, in connection with the water undertaking, the shareholders might have noticed that the Directors had put into the accounts an additional item, which read thus—"Provision for special rebate to Municipality for year 1896, £350." The reason this had been included was this: In 1896, the supply of water was not altogether as it should have been, through circumstances not under the control of the Company. Nevertheless, it was a fact that the supply to some of the consumers was insufficient; and the Directors therefore made a proposal to the authorities that they should make a reasonable allowance to meet that which they thought was a fair incident. They had not agreed with the authorities upon the subject; but, as a matter of fact, they had offered them a sum which was represented by the £350, as the Directors thought this a fair way of meeting the difficulty. The Board proposed to continue this asset in the balance-sheet in the hope that it might be accepted by the authorities—at all events, it provided that which the Directors pledged themselves to pay. Concerning other matters, the mains and reservoirs were in complete working order. The repairs to the storage reservoirs had been finished; and the cost was included in the present accounts. The supply, he was glad to say, continued (as it had now, with a slight exception, for more than thirty years) to the entire satisfaction of the city authorities. It was interesting to note—and the information might be useful to other companies—that, out of 1876 houses supplied in Cagliari, 449 were served by meter, and the remainder by contract; and in 1360 houses the fittings belonged to the consumers, and in 516 to the Company. The capital employed in this fitting account (which had been very advantageous to those people who could not conveniently afford to find the required amount for such work) had been, so far as the Company were concerned, very beneficial—in fact, it showed, while it had been a great public convenience, a profit of 9 per cent. The supply of water to the villages around Cagliari continued to increase; and it had been an immense benefit to those parts of Sardinia which would have been without a water supply but for the Company's great works being in operation in Cagliari. As to the gas undertaking, the illuminating power of the gas had been maintained during the year. There had been no fines, and entire satisfaction had been given. The increase in the supply of gas, especially to private consumers, had been most gratifying—totalling to 7¾ per cent. for the year. Cheaper coal had no doubt been of considerable assistance; and the rate of exchange had also helped the Company very much. Coal, which had cost them 28s. 9d. per ton, afterwards came down to 23s. 5d. per ton; and the last cargo cost 19s., delivered at Cagliari. The Directors hoped that they had made an arrangement which would even lessen that cost. The introduction of regenerative firing in the retort-settings had also had a beneficial effect. The gas-fittings business had progressed satisfactorily; and the Directors were hoping for a further increase in the coming year. As to the future, the population had grown, trade and commerce had greatly improved, and, if required, further proof of the prosperity of Italy was shown by the greater value of Italian Consols, in which, he was glad to say, the Directors a few years since invested a considerable amount of the reserve and sinking fund. In corroboration of this, he quoted from a report by Mr. Simmelkjor, whose active interest on behalf of the Company, he said, the Directors much appreciated. Mr. Simmelkjor observed: "It is my pleasing duty to call your attention to the enormous progress made by Italy during late years. The Italian Consols are above par, and the loss on exchange near to vanishing-point—showing that the progress is real and not imaginary, and the confidence in the country perfectly justified." Mr. Simmelkjor said much more to the same effect. Concluding his remarks, the Chairman said the relations of the Company with the Government and the Local Authorities continued most satisfactory; and he believed they were greatly pleased with the way the Company's duties and obligations had been carried out, and by the attention paid to their requirements by Mr. Sanna, Mr. Webster, and the other representatives of the Company. He then moved the adoption of the report and accounts.

Mr. J. J. Barrow seconded the motion, which was unanimously carried.

Proposed by the Chairman, and seconded by Mr. S. Simmelkjor, a dividend at the rate of 8 per cent. per annum for the past half year was declared (making 7 per cent. for the year), together with a bonus of 2s. 6d. per share.

On the motion of the Chairman, seconded by Mr. W. R. Galbraith, the retiring Directors (Mr. J. J. Barrow and Sir Frederick Wigan) were re-elected; and afterwards the Auditors (Messrs. H. Bishop and R. S. Robb) were also re-appointed.

The usual complimentary votes terminated the proceedings.

HARROW AND STANMORE GAS COMPANY.

The Half-Yearly Meeting of this Company was held yesterday week, at the Albion Tavern, Aldersgate Street, E.C.—Mr. C. Horsley, J.P., in the chair.

The Engineer and Secretary (Mr. J. L. Chapman) having read the notice convening the meeting,

The Chairman said the report the Directors had submitted to the shareholders was very clear. It showed that the business was progressing, and that the competition of the electric light was not shutting their own light up. On the contrary, they were going ahead; and Mr. Chapman expected to go farther still, and so much so that the Directors were compelled to make extra provision for meeting the demand. The report informed the shareholders that there was a balance on the profit and loss account of £3896; and from this the Directors recommended that a dividend be paid at the rate of 8 per cent. per annum on the "A" capital, of 7 per cent. on the "B" capital, of £5 12s. per cent. on the "C" capital, and of 6 per cent. on the guaranteed capital. Before passing to the accounts, he might mention that Mr. Arthur F. Phillips had joined the Board, in place of their old friend Mr. James Glaisher. Mr. Phillips, as the shareholders were aware, was a man of wide experience in gas and water matters; and consequently he would make a most useful member of the Board. The accounts for the half year were very satisfactory. They showed that the gas-rental had amounted to £8881, which was an increase of £524 over the corresponding period of last year, notwithstanding the reduction of 3d. per 1000 cubic feet. This was an indication that the increase in the gas

consumption must have been very good; and the figures given him by Mr. Chapman proved that it was so. The increase in the Harrow district was 17·26 per cent.; in Sudbury and Harrow Weald, 6·36 per cent.; in the Stanmore district, 11·95 per cent.; and for public lighting, 1·77 per cent.—the total over the whole district of supply being 12·73 per cent. But coming to residuals, there had been a fall in the price of coke of about 6s. per ton; and this represented a decrease of £352. The variations in the other items were small. However, the total receipts for the half year amounted to within a few pence of £10,700, which was an increase of £283 over the second half of last year. The expenditure totalled to £7592, which was an advance upon the corresponding period of £126. Coal and oil had cost less by £134; but, on the other hand, an additional £286 had been spent in repairs to works, mains, and stoves and meters. The Harrow Council now lighted, extinguished, and repaired their own lamps; so that the item of public lighting had been reduced to that extent. The other differences were not worth mentioning; but he might add that £200 had been written off the suspense account. The result was that they had a profit for the half year of £3107, or an increase of £146. The dividend and loan interest would absorb £3026; so that there was a surplus of £71 on the half year, which would make the balance to be carried forward £1352. Regarding the manufacturing operations, the make of coal gas was 31,821,000 cubic feet, and of carburetted water gas 14,315,000 cubic feet. The quantity of gas produced per ton of coal was 10,561 cubic feet; and the oil used per 1000 cubic feet was 2·93 gallons. The unaccounted-for gas on the half year was 9¼ per cent.; but, taking the whole year, it was only 7·15 per cent. The coal carbonized had been cheaper by 2s. 6d. per ton; but, as he had said, coke had fallen in value by 6s. per ton. With an increase of 12¾ per cent. in the consumption of gas, they had had great difficulty in keeping up their gasholders; and therefore they were building a new retort-bench, and putting in new condensers and exhausting plant all complete. This would use up all the money they had got, and more; and so the shareholders would see that before long more capital would have to be provided. He concluded by moving the adoption of the report and accounts.

Mr. A. H. Baynes seconded the motion; remarking that although the half year had not been a very rosy one for gas companies, they had held their own at Harrow, and, moreover, showed a considerable increase. The Company's outlook, indeed, had never been better than it was to-day.

Mr. James Randall having congratulated the Directors on the position of the Company, said he noticed that the capital account showed a balance overdrawn of £4813. The unissued capital only amounted to £11,935; nearly half of which would be absorbed by the sum overdrawn. Therefore, sooner or later they would have to get further money powers from somewhere; and, before they did this, it would, he thought, be wise to wipe off the item in the balance-sheet "suspense account, £200."

Mr. Chapman explained that, at the time parliamentary powers were obtained in 1894 in connection with the purchase of the Stanmore works, the Board thought it wise to place £1500 to repairs. This sum was put to a suspense account; and they had gradually written it off. As the Chairman had remarked, £200 had been written off in the past half year; and the Directors hoped to clear away the balance during the current half year.

The motion was unanimously agreed to.

The dividends mentioned in the Chairman's opening remarks were declared; and subsequently resolutions were passed, re-electing the retiring Director (Mr. A. F. Phillips) and Auditor (Mr. Horace J. Rydon, J.P.).

The thanks of the shareholders were recorded to the Chairman and Directors and to Mr. Chapman. In responding, the latter, speaking of the success of the Company during the half year, said he thought the Directors were to be congratulated on their pluck. In three years, the cost of coal rose something like 7s. per ton; and the price of gas was only increased 3d. per 1000 cubic feet. When the price of coal fell 2s. 6d. per ton, the Directors again lowered the price of gas by 3d., which really left the Company 4s. 6d. per ton of coal to the bad. There was also a great fall in the value of coke; but, notwithstanding these adverse circumstances, they had gone forward prosperously. The accounts also showed that they were now able to spend more money on the rearrangement of the works and on repairs.

This concluded the proceedings.

GAS, WATER, AND GENERAL INVESTMENT TRUST.

The report submitted at the annual meeting of the Gas, Water, and General Investment Trust last Tuesday stated that the revenue for the past year, after making provision for interest on debenture stock and all expenses, amounted to £43,413, to which had to be added the balance of £7681 brought forward. Interim dividends were paid for the half year ended July 28 at the rate of 4½ per cent. per annum on the preferred stock and 2 per cent. on the deferred stock, amounting to £9269; and the Directors recommended the appropriation of a further sum of £13,447 to the payment of dividends at the rate of 4½ per cent. per annum on the preferred stock and 6 per cent. on the deferred stock—making for the year 4½ per cent. on the preferred stock and 4 per cent. on the deferred stock. This would leave a balance of £28,378, of which the Directors proposed to place £8500 to a dividend equalization account, and to carry forward £19,878.

The Chairman (Mr. J. B. Braithwaite), in moving the adoption of the report and accounts, said they met at the close of the year with a further instalment of progress in the direction indicated for the past three or four years. They had attained two of the items in the programme which they set before themselves. The first was to raise the carry forward to a sum equal to the amount of the debenture interest for the whole year—namely, £20,000. In addition to this, they were enabled to set aside £8500 to a dividend equalization account, which was mainly for the benefit of the deferred stockholders. They were doing what they could to assure them their dividend of 4 per cent. Then they had reached another point in their programme—that was, they had ascertained as nearly as they could ever hope to do what was the amount of their depreciation; and they were able to say this year for the first time that the securities they held stood in the books at approximately the price at which they stood in the balance-sheet. Turning to the revenue account, this showed a reduction in the value of securities from £1,007,371 to £940,601, which arose chiefly from the writing down of the value of some of the investments which were permanently depreciated; and this writing down, of course, had gone to swell the figure of the suspense account for the adjustment of securities. They had gone a long way towards liquidating the payments in respect to the reconstruction of the Salt Lake and Ogden Gas and Electric Light Company, which now only stood at £5102; the reason for this being that they had applied the proceeds of a portion of the bonds they held against that in liquidating about £10,000 of the amount. The revenue account naturally showed very considerable changes. The ordinary revenue amounted to £45,952, as against £48,480 for the previous year, showing a decrease of £2528. This decrease was accounted for chiefly by the fact that they did not make quite so much through underwriting and syndicates as in 1900. A new item in the revenue account was the sum realized by the sale of a portion of the Utah Light and Power Company's bonds. The condition of that Company had been improving so steadily that it had attracted attention in America, with the result that the Trust received an offer for their entire holding of the 5 per cent. bonds; and of this offer they had taken advantage. Had they not, however, had this windfall from the realization of the Utah securities, they would still have been able to pay the increased dividend and raise the carry forward from £7600 to £8500. On the debit side of the revenue account, there was no change. The expenses of management and debenture interest remained the same, though income-tax was, of course, somewhat more. Referring to the Utah Light and Power Company, he said there was no doubt that at Salt Lake City they had one of the largest and most complete water-power installations for the supply of electricity anywhere in the world; and this was supplemented by a very large steam generating plant. After dealing at length with the other securities held by the Trust, he said it was the intention of the Directors, unless anything unforeseen occurred, to increase the interim dividend on the deferred stock next August to the rate of 3 per cent. per annum. In conclusion, the Chairman announced the receipt of a telegram saying that the Utah Power and Light Company had just declared a dividend of 1 per cent. on the preferred stock, which would bring a considerable revenue into the next accounts.

The report having been adopted and the dividends declared, an extraordinary meeting was subsequently held for the purpose of altering the Articles of Association, in order to bring them into harmony with the Companies Act of 1900.

SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Mr. Alfred Richards offered for sale, by order of the Directors, £10,000 of additional "B" consolidated stock of the Tottenham and Edmonton Gas Company; being a portion of the additional capital authorized to be raised in pursuance of the powers of the Company's Act of 1898. This stock ranks for a standard dividend of 3½ per cent., subject to the sliding-scale; the last dividend on the existing "B" capital having been at the rate of 4 per cent. per annum. A reduction in the price of gas having taken effect as from the Christmas quarter, this stock will, by virtue of the sliding-scale, be entitled to a dividend for the half year to the 30th of June at the rate of 4½ per cent. per annum, if earned. The average price realized was £100 19s. 8d. per £100 of stock, yielding the investor £3 19s. 3d. per cent. On the same occasion, Mr. Richards carried out the instructions of Directors of other Companies to dispose of new issues. The first lots offered consisted of £10 preference shares (5 per cent.) in the South-West Suburban Water Company They were the first submitted for public competition under the powers obtained by the Company in 1900; and they fetched on an average £12 1s. 6d. per share—yielding £4 2s. 10d. per cent. The next lots were £10 "C" shares in the Harrow and Stanmore Gas Company, ranking for a standard dividend of 7 per cent.; the last on similar shares having been at the rate of £5 12s. per cent. per annum. The average price realized was £10 11s. 2d. per share, which returned the investor £5 6s. per cent. The final lots were some £10 ordinary shares in the Barking Gas Company (last dividend 6 per cent.), and they fetched from £10 15s. to £11 12s. 6d. apiece, or an average of £10 19s. 10d.; yielding £5 9s. 2d. per cent. On the following day, Messrs. Drawbridge and Ansell, of Hayward's Heath, conducted a successful sale of shares in the Burgess Hill Water Company at the Old Ship Hotel, Brighton. It consisted of an issue of 350 new ordinary £10 shares, ranking for a dividend of 7 per cent. per annum; and the whole were disposed of—320 at £14, and 30 at £14 2s. 6d each; the total amount realized being £4903 16s.

Sutherland Meter Company, Limited.—Under this title a Company has been registered with a capital of £40,000 in £1 shares, to adopt an agreement between J. F. & G. E. Wright and A. G. Sutherland, and to carry on the business of meter manufacturers and vendors, engineers, ironfounders, &c. There will be no initial public issue.

The Rival Water Schemes in Kent.—At the last meeting of the Hollingbourne Rural District Council, the Clerk (Mr. Bracher) read a long agreement, to which the seal of the Council was afterwards affixed, providing that, if the Mid-Kent Water Company were prepared to accept certain conditions, the Council would not oppose their application for powers to supply the district with water. Mr. J. S. Davy (Local Government Board Inspector) said he thought this arrangement—which he believed would give satisfaction to all the ratepayers concerned, and, he hoped, to the Water Company—was largely due to the zeal, ability, and sense of public duty displayed by Mr. Bracher. The proposals of the Company, as well as an alternative scheme of the Council, were recently the subject of a Local Government Board inquiry (as reported in our issue for the 4th ult., p. 296), when a large amount of influential local support was accorded to the Company's suggestion to supply the villages of Leeds, Hollingbourne, Harrietsham, and Lenham with water.

CARBURETTED WATER GAS IN LIVERPOOL.

Suggested Deputation to the Home Secretary.

At the Meeting of the Liverpool City Council last Wednesday—the Lord Mayor (the Right Hon. Alderman Petrie) in the chair—the report of the Special Sub-Committee of the Electric Power and Lighting Committee on the subject of the supply of carburetted water gas in the city (*ante*, p. 223), was under consideration.

Mr. Dart moved that the report be approved, and that the Committee be authorized to ask the Home Secretary to receive a deputation on the matter dealt with therein.

Mr. Lister asked why it was stated that water gas was objectionable. It had been in use for five or six years, and they had never had a complaint. The gas was a little heavier than coal gas, and required a larger opening in the burner. There had been no accidents or more trouble with it than with coal gas.

Mr. Dart: Is Mr. Lister in order?

The Lord Mayor ruled that he was in order.

Mr. Lister, continuing, said he wanted to know what evidence there was that water gas had proved deteriorating to the public health. He did not notice that the death-rate was any higher—in fact, he thought it was rather lower. But he would not attribute this to the use of water gas; yet it might have had something to do with it. He should like to know why a deputation was to visit London and go to the Home Office—what grounds had they for doing so? The Company had faithfully served the city for years. ("Oh!") They might say "Oh," but the Company had fulfilled their statutory obligations without a complaint, and under the control of the Council's Auditor and Engineer; and the Council had never caught the Company napping. They had supplied the best gas in England at the lowest price; and he would like to know from the Chairman of the Committee what arguments he was going to advance to the Home Office to request them to legislate as to the quantity of carburetted water gas that should be mixed with coal gas. They were able to supply up to 18 or 20 per cent., and they had had no accident from it; and he thought that before going to London to request legislation on this point, they might have had the courtesy to ask a member of the Gas Company's Board to go with them, because he would probably have more knowledge on the matter.

Alderman Smith considered that it was not a nice spectacle to see Mr. Lister chuckling at the idea that the Council had not been able to catch the Gas Company napping. They could not catch them at all, napping or otherwise; and they could not get a decent answer to their letters——

Mr. Lister: I rise to a point of order. I entirely deny that.

The Lord Mayor: That is not a point of order.

Alderman Smith said that what he wished to say with regard to the Gas Company was that the old statutes under which they acted had never provided for water gas and all the various enrichments which had since been discovered; and they had given them powers that were never contemplated. They were powers which made them able to deride and smile at the ratepayers of Liverpool. Instead of Mr. Lister bringing the cost of gas down to 1s. 6d. per 1000 cubic feet, at which the Corporation could supply it if they owned the gas-works, he smiled, and talked about the Corporation, who had been trying for the last seven years to get in touch with the Company, and to look at things as reasonable men, not catching the Company napping. Did they think he wanted a jaunt to London at the expense of the ratepayers or Company? He did not want to go to London. But it was necessary that the Company should be brought into line with modern improvements, and that the people of Liverpool should bring the strength of public opinion to bear on the conduct of the Company, who could not afford to defy public opinion in the brazen way they had done for so long. He quite hoped that, with the advance of science, there would be a gain of some sort to the citizens of Liverpool. He waited to see them carry out their water-gas plant, and he had hoped that the consumers would get some benefit. They did not get any, and would not, unless they were able to impress Mr. Lister that this was no longer a joke. He (Alderman Smith) hoped they would get Parliament to move, not only in regard to this matter, but to the Gas Company generally, and take away some of those privileges which he respectfully thought they had abused, and bring up to date some old Acts of Parliament.

Alderman Burgess was glad the Lighting Committee had seen their way to take the action the city had for a very long time past been looking for them to take. They had heard some time ago how very injurious water gas was to the health of the people into whose houses it was taken. Those of them who had to depend upon gas in their houses were very anxious indeed that the Corporation should do something to ensure that what they paid the Gas Company for was such as they ought to be supplied with in the interest of the health of the city. He could not help feeling very great surprise at Mr. Lister expressing the opinion that they had in Liverpool not only the best, but the cheapest gas. In a town less than 12 miles distant, gas was supplied at not more than 2s. per 1000 cubic feet, which was a great deal cheaper than they got it for in Liverpool. He was very glad the Committee had taken this step, and sincerely hoped they would be able to induce the Government to introduce a Bill to prevent a very large proportion of water gas from being used in Liverpool or anywhere else.

Mr. R. D. Holt expressed the hope that the report would be widely circulated. The recommendation the Committee made was one he thought the Council most heartily endorsed. Mr. Lister said there was no evidence of the injurious effects of the gas; but if he consulted almost any medical practitioner, he would be told that the escape of the gas had a tendency to reduce to a very alarming extent the vital tone of those who inhaled it. He felt that they should pay very strict attention to the monopoly the Gas Company had in supplying gas to the people of Liverpool. This was a matter which the Gas Company and the Corporation could have talked over together in an amicable and friendly spirit, and come to some conclusion.

Dr. Permewan remarked that Mr. Lister had said there was no proof of water gas being injurious to health. He would stake his reputation as a medical man upon the fact that the influence of water gas in connection with diseases of the throat was undoubted; and he personally was a sufferer by it. He could trace two acute attacks of throat trouble to the escape of water gas from the house in which he resided. He was very strongly of opinion that many cases of severe illness for which causes could not often definitely be found could be traced to the escape of this gas. He cordially supported the Committee.

Mr. Dart said strong evils required strong remedies. He could not help thinking, although it was a strong thing to say, that it would be a good thing for the community of Liverpool if a few people were absolutely killed by that cause. ("Oh.") He was disposed to think that this sad loss of life would be, on the whole, cheap compared with the enormous harm done to the population by the constant and extravagant use of gas at all. He contended that no gas ought to be used in this enlightened age; and if the citizens of Liverpool were only awake to the interests of their own health, they would have no gas at all—no matter whether it was good, bad, or indifferent, cheap or dear. He could not speak in the same strong terms of the Gas Company as did Alderman Smith, because he felt the Company were fighting for a dying concern. They as a Corporation were opposing the Company; but he knew in the past the Company had done work for the city. He would draw the attention of the Council to the fact that they were only asking the Government to bring in a Bill to carry out the recommendations of their own Departmental Committee.

The proposal was ultimately agreed to.

GAS PROFITS AND THE RATES AT BELFAST.

A Special Meeting of the Council of the County Borough of Belfast was held on Monday last week—the Lord Mayor (Sir Daniel Dixon) presiding—to take into consideration and adopt the minutes of the Finance Committee, with the estimates of the probable expenditure for the ensuing year, and of the rates to be levied to meet the same.

Mr. James Johnston (the Vice-Chairman of the Finance Committee), in moving the adoption of the report of his Committee on the estimates for the year ending March 31, 1903, said they recommended that the rate on the borough fund be 1s. 3d. in the pound, which would yield £67,500, to meet the estimated requirements of £66,885; on the police fund, 8d in the pound under £20 valuation, and 1s. 4d. at and over £20 valuation, which would yield £52,800, to meet the estimated requirements of £51,945; on the general purposes fund, 2s. 10d. in the pound, which would yield £144,500, to which they had to add £15,000 which the Gas Committee had been good enough to vote out of the profits of the gas-works, making a total of £159,500, to meet an estimated amount of £164,830. A special rate for malicious injuries—1d. in the pound—would yield £4250. These made the total estimated receipts £284,050, to meet an estimated expenditure of £283,660. The total rate for municipal purposes would now stand at 4s. 10d. in the pound on property under £20 valuation, and 5s. 6d. in the pound on property at and above £20 valuation, which was an increase of 1d. and 2d. respectively on that of last year. The proposed estimates would compare favourably with those of the past five years, which was the time embraced in the accumulation of the surplus of £30,000 used last year. The proposed rate this year, including poor-rate, would be 5s. 10d. in the pound on property under £20 valuation, and 6s. 6d. in the pound on property at and over £20 valuation; whereas the average of the last five years was 6s. 0½d. in the pound on property under £20 valuation, and 6s. 8½d. on property at and over £20 valuation.

Mr. Malcolm seconded the motion.

Alderman W. M'Cormick remarked that Mr. Johnston forgot to tell them that, if the rates were not to be more than 2d. higher than last year, this was practically due to the fact that the Gas Committee were giving £18,000 in relief of the rates.

Mr. Johnston pointed out that he had mentioned that the Gas Committee were granting £15,000.

Alderman W. M'Cormick said £3000 more had been taken out of the gas fund this year for interest and sinking fund for the City Hall than was the case last year; and this, added to the £15,000, made the £18,000 to which he had alluded. That was not the only amount they drew from the gas fund; for they took £600 annually, and this year they were taking £5500 in relief of the rates in addition to the £15,000, which practically, he assumed, left them without a copper. This, if his figures were right, amounted to a total of £21,500. He was very glad the city was not to be saddled with any additional taxation other than 2d. in the pound; but he objected completely to any trading institution, such as the Gas Committee, giving away out of its resources such an enormous sum of money as £21,000 in one year to relieve the rates. By taking this step, they made the gas consumer in the city relieve the man who did not consume gas; and they gave the electric light man relief, though he did not contribute a single penny to the cause of the relief. He would like to point out also that this matter arose upon the estimates. He was of opinion that, in strict order, the Gas Committee's minutes should first have been approved by the Council before the estimates were introduced: for they did not know yet whether the Council would consent to the Committee parting with £15,000. No information had been supplied as to the state of the gas funds; but, whether or not the profits warranted the proposed grant, nothing was more common at the meetings of the Finance Committee during the year than to hear of a debit balance being recorded against the gas fund in the fortnightly reports. Of course, he knew that this arose chiefly from the fact that enormous expenditure had to be incurred before the quarterly revenue came in; but did not this suggest another idea—that if this were so, the gas-works was an undertaking which required a very large working balance. In his judgment, unless the profits of the past year were unusually high, the Council were adopting a dangerous course by appropriating such a large sum of money to the reduction of the rates. He urged the necessity of retrenchment by the various Committees in the matter of expenditure, and complained that, instead of this, they found increases in nearly all the departments. It was most important that they should avoid drawing upon such sources as they had drawn upon this year. Last year it was stated that from accumulated balances they had applied

£30,000 in relief of the rates; and this year they were applying £18,000 for the purpose. The £30,000 was gone; and he did not think the Gas Committee would supply them next year with another £15,000.

Alderman J. M'CORMICK said he thought there was no cause for dissatisfaction in regard to the estimates. Alderman W. M'Cormick had referred to the fact that there was a slight additional payment being made by the Gas Committee in respect to the City Hall. It ought to be remembered that this payment was being made in pursuance of a resolution of the Corporation; and they must recognize the fact that, as the City Hall increased, the expenditure increased, and consequently the contribution to the sinking fund and interest must increase also. It was important that the ratepayers should have full information as to the position of the Corporation in regard to the rates. Last year, owing to a considerable balance to the credit of the Corporation, they were able to make the rates something like 6d. in the pound less than they otherwise would have been, by taking advantage of £30,000 which stood to their credit. This year, although the estimates were practically the same in the various departments, they were not in the happy position of being able to allocate £30,000; and, under these circumstances, the Finance Committee thought it reasonable and right to make application to the Gas Committee for a grant. He entirely joined issue with his friend Alderman W. M'Cormick as to the wisdom of obtaining such a contribution. He had told them that this was putting the Gas Committee in the position of a great trading company. Why should it not be? What was the policy of the Act under which the Corporation acquired the gas-works? It was that in any year in which the charge for gas did not exceed 3s. 9d. per 1000 cubic feet, the surplus funds were to be used for the relief of taxation. As to the gas consumers, if they created the surplus they were also receiving the benefit in the reduction of taxation; and he maintained that all the owners of the gas-works—not merely the gas consumers, but the entire community—were entitled to share in these benefits. He understood the consumers received gas at the rate of 2s. 3d. per 1000 cubic feet; and he thought this would be found to compare exceedingly favourably with any other city in the three kingdoms. There was another matter they should not overlook. The Gas Committee had never been debited for wayleaves. Why should a sum not be allocated, as against the Gas Committee, for wayleaves and matters of that kind? If this were done, he believed it would amount to more than the contribution of £15,000 now asked at their hands. He did not think the resources of the Gas Committee were at all unequal to the demand being made upon them. Last year, though there was a debit against them, there was also a large balance of £60,000 of outstanding debts. He held that the demand made by the Finance Committee was a justifiable one, and was well grounded in policy.

The estimates, after further discussion, were passed; 35 members voting in favour of them, and 6 against.

The ordinary Monthly Meeting of the Council was then held; and the minutes of the Gas Committee came up for confirmation. These minutes contained the following resolutions: "That a grant of a sum of money should be made out of the gas profits to be earned during the incoming year in aid of the rates for the year ending March 31, 1903;" and "That this Committee recommend the Council to allocate in the coming year £15,000 out of the gas profits as a contribution towards the reduction of rates."

Mr. ANDREWS moved, and Mr. CUNNINGHAM seconded, the adoption of the minutes.

Mr. DEMPSEY and Mr. MAGEE objected to £15,000 being contributed in relief of rates when it had not been earned.

The LORD MAYOR said the remedy was to raise the price, which was now too low.

Mr. CURLEY quoted the resolutions; and said it was not stated when the money was to be earned.

Alderman J. M'CORMICK said the first of the resolutions contained an error. Nothing was said with respect to the profits being taken out of the unearned profits of next year. The rate was not struck until the first of next month; and the current year of the Gas Committee would have expired before the rate was struck on April 1. The second resolution was perfectly in order. To reduce the price any further would be to supply gas to the large consumer at under cost price. The plain way to meet the difficulty would be to follow out the policy of the Act under which the gas-works were acquired—namely, to use the profits in the reduction of rates, in which the small consumer, like everyone else, got the benefit.

Mr. ANDREWS said the first resolution was purely academic, and accepted the principle of voting a sum in aid of the rates. In the next resolution, the words "to be earned during the incoming year" should be struck out. The larger consumers, he contended, obtained gas at under cost price.

The LORD MAYOR: You should have raised the price.

Mr. ANDREWS said he wished they had done so. The matter of discounts made the question of price exceedingly difficult. It was a bad inheritance; but, so long as it existed, there was no doubt that when fuel was dear the large consumer would get gas at a lower price than he ought to have it at. It was impossible to forecast the profits of the undertaking; but he should not have been a party to the voting of £15,000 in aid of the rates had he not believed that the money would be earned. He moved the deletion of the words "to be earned during the coming year."

Mr. CUNNINGHAM seconded; and the minutes were passed as amended.

Langport Gas-Works Change Hands.—With reference to the advertisement of the Langport Gas Company, offering their works for sale or on lease, which appeared in our pages during January, we learn that the undertaking has now been disposed of. The works will be taken over on the expiration of the present lease next June, when an entirely new plant will be laid down. The mains also will be completely renewed, and probably extended to Curry Rivel. The prospect of good quality gas in the near future will, it is considered, solve the question of street lighting, for which purpose experiments have recently been made with the Kitson llght.

MANCHESTER CORPORATION GAS AND WATER SUPPLY.

At the Meeting of the Manchester City Council on Wednesday, the proceedings of the Gas Committee were confirmed without discussion. The Clerk to the City Justices has written to the Committee stating that arrangements will be made as soon as possible for the carrying out of the "double test" for gas-meters before these are issued to consumers by the Committee. A communication has also been received from the Gas Committee of the Stockport Corporation, in which they agree to purchase the portion of the gas undertaking of the Manchester Corporation which is in the district of North Reddish, on the terms proposed by the Manchester Committee. The Committee also submitted to the Council, in a separate motion, a number of recommendations as to increases in salaries. In a statement prepared by the Chairman and Deputy-Chairman, showing the duties and responsibilities of the officials recommended for advances, it was mentioned that the total length of gas-mains, varying from 2 to 36 inches in diameter, was now 820 miles; that there were 14,000 public lamps within the city; and that the number of men engaged in the Street Mains and Lighting Department was 424. In connection with the show-room in Deansgate, there was a staff of 46, engaged in examining, cleaning, repairing, collecting, and delivering stoves, and fixing grillers to the prepayment meters. There were 12,983 stoves on hire; and last year 10,287 stoves and 5107 grillers passed through the show-room and the workshop connected with it. The Chairman (Alderman Gibson) having moved the adoption of the Committee's recommendations respecting the salaries, Mr. Trevor asked if he had ascertained whether the proposed advances would represent a permanent additional expenditure in the Gas Department, or whether there were any rearrangements whereby the suggested advances would not be altogether an extra charge. Alderman Gibson said he had not made any particular inquiry in this case; but he had previously stated that increased salaries did not necessarily mean an augmentation of the expenses of the department. The proposed advances were unanimously agreed to.

The minutes of the Water Committee contained a reference to the arrangements which are being made to expedite the work of laying a second line of pipes to Thirlmere; and on this point Mr. Simpson remarked that the Engineer (Mr. G. H. Hill, M.Inst.C.E.), had decided in favour of cast-iron in preference to steel pipes. He (Mr. Simpson), however, thought it would be wise to appoint a small Committee to make inquiries as to which class of pipes were really to be preferred, and to visit places where steel pipes had been used. In Hamburg, the authorities had, he said, discarded the use of cast metal altogether. The same rule was in force in other places in Germany; while in America they were using miles of steel tubing. The Chairman (Sir John J. Harwood) replied that the Committee were guided by the experience and knowledge of their Engineer, and deprecated the idea of sending a number of men abroad to inquire concerning matters of which they had no special knowledge. The minutes were passed.

THE PRICE OF GAS AT HALIFAX.

At the Meeting of the Halifax Town Council last Wednesday, the Chairman of the Gas Committee (Mr. G. H. Wadsworth) moved the following resolution, of which he had given notice: "That on and after March 25, 1902, the price of gas supplied within the borough be advanced from 2s. 2d. to 2s. 5d. per 1000 cubic feet, and that the price of gas supplied outside the borough be advanced from 3s. to 3s. 3d. per 1000 cubic feet, in each case with the present scale of discounts." It was, he said, a painful thing for him to do, for he had to tell the ratepayers a rather mournful story about the gas-works. The fact was that last year's estimates had, in the result, been falsified. Coal, reckoned at £44,000, had cost £50,270; the sale of gas had proved lower than the estimates by some £3000. It was the same with coke; they estimated the income at £13,000, whereas they had received only £10,100. From the sale of tar they expected to get £5000, but they had obtained only £4250. The result of the year's working had been that they had a loss of income of £6205, and an increased expenditure over the estimates of £5132. Instead of having a small surplus to hand over in relief of the rates, they had a deficit of £11,365 on the year's working. Mr. R. Fawcett seconded the motion. Alderman G. H. Smith said it seemed to him very strange that the Corporation should embark on such heavy expenditure in extending plant for making more gas if their consumption was not increasing. But what he wanted particularly to draw attention to was this: For some time they had been doing their best to encourage the consumption of gas for manufacturing purposes; and he urged that, in making a change in the price, they ought to consider business men who were large customers. He moved that the price to consumers in the borough be fixed at 2s. 6d., subject to the following discounts: Customers up to £100 per quarter, 8⅓ per cent.; up to £150, 10 per cent.; up to £200, 12½ per cent.; up to £250, 15 per cent. He and others had fought strenuously in the Council for some time against the continual increase in the capital expenditure on the gas-works. They had £600,000 capital invested there, and arrangements had been made for increasing it during the coming year by £40,000. It was time they realized the necessity for spending no more on capital account until it was shown that the consumers' requirements were ahead of the productive capacity of the plant. Mr. J. W. Clark seconded the amendment. After some discussion, Mr. Wadsworth appealed to Alderman Smith to withdraw his amendment; saying that if the Gas Committee could see their way to allow the large consumers a greater discount they would do so. The amendment was put and rejected. Thereupon Alderman Smith moved another amendment, to the effect that the price be 2s. 5d., and that the discounts be as follows: Up to £50, 8⅓ per cent.; up to £100, 12½ per cent.; above £150, 15 per cent. This amendment was rejected; and then the original motion was agreed to.

We learn that "Drake's, Limited," have just received an order from the Bromsgrove Gas Company for the erection of two settings of eight retorts on their patent tube regenerator principle.

SOUTHPORT AND BIRKDALE GAS SUPPLY.

The Local Government Board's Reply.

Our readers may remember that a Local Goverment Board inquiry was held at Southport a few weeks ago (see *ante*, p. 219) into an application made by the Corporation for authority to reduce the illuminating power of the gas, lower the maximum price, alter the method of testing, sanction agreements with consumers of gas for other than lighting purposes, and confirm an agreement with Birkdale. On that occasion, the Town Clerk announced that the agreement with the neighbouring Local Authority contained the following provisions: "(1) That the illuminating power shall be reduced from 20 to 16 candles. (2) That the maximum price to private consumers in Birkdale shall be reduced to 4s. from 4s. 6d. per 1000 feet. (3) That, at current prices, there shall be a reduction of 4d. below the existing prices, which were 2s. 8d. in Southport and 3s. 2d. in Birkdale, with a special provision with regard to old cooking customers, who were charged 3s. in Birkdale and 2s. 6d. in Southport. (4) That any alteration from the price above fixed shall apply equally in Southport and Birkdale. (5) Southport or Birkdale to have full power to apply at any time to the Board of Trade to approve any burner for testing purposes after six weeks' notice. (6) That the maximum price charged for lighting the public streets shall be reduced 9d., making 2s. 9d. instead of 3s. 6d. per 1000 cubic feet. (7) That the discount allowed to private consumers under the 30th section of the Act of 1871 shall be continued. (8) That the Corporation may, under the Order, with the consent of the Birkdale Council, reduce the candle power to 14 after one month's previous notice in writing." The reply of the Board was communicated last Tuesday to the members of the Gas Committee of the Southport Corporation, and of the General Purposes Committee of the Birkdale District Council. The Board authorize the reduction of the illuminating power from 20 to 15 candles, but not to 16, with a possible drop to 14 by agreement; also the alteration in the method of testing, the use of a common burner, and the reduction of the maximum charge. But they decline to authorize the Corporation to enter into any agreement with other bodies, where such agreement might disturb previous Provisional Orders; and they will not grant leave to allow special discounts to customers, or to make by arrangement a kind of Mond gas for power purposes. This reply affects the arrangement entered into between Southport and Birkdale, and probably some variation in the terms agreed upon between the two authorities will have to be made.

SUNDAY LABOUR IN THE EDINBURGH GAS-WORKS.

Replies to Inquiries by the Church of Scotland.

The following are the queries put to the Edinburgh and Leith Gas Commissioners, on behalf of the Church of Scotland, with regard to Sunday labour in the Commissioners' Gas-Works (to which reference was made in our Scotch Correspondent's "Notes" last week), and the replies of Mr. W. R. Herring, the Chief Engineer, as adopted by the Commissioners on the 24th ult.

Q. To what extent does Sunday labour go on in your particular branch of industry?—A. Gas-making operations never cease, day nor night, year in year out.

Q. The kind of work done?—A. The manufacture of gas only.

Q. How far do you consider it unnecessary, and how far necessary and unavoidable?—A. No work whatever is performed on Sunday that can in any way be avoided; and it is hoped that our structural conditions will be such in the near future as to permit of a still further reduction of Sunday labour.

Q. Do you think the work might be so arranged as to reduce or minimize labour on the Sundays?—A. This is already done as far as safety permits.

Q. Approximately, what is the proportion of men employed on Sunday as compared with other days?—A. Less than one-half; practically 45·2 per cent.

Q. What number of hours do they work on Sundays?—A. During the winter season, there are 1242 men employed in all departments of the works, and during the summer season 814 men; giving an average all the year round of 1028 men. On Sundays there are 465 men employed on an average for the year. Two-thirds of this number are divided into three shifts, and work under the following conditions: The shift which first begins employment on Sundays starts work on Saturday nights at 10 o'clock, and is on duty until 6 o'clock on Sunday morning. The second shift begins work at 6 a.m. on Sundays, and continues on duty until 10 p.m.; the actual duration of physical labour during this period of 16 hours amounting to from eight to ten hours. The third shift begins work at 10 p.m. on Sundays, and leaves off at 6 a.m. on Mondays. The result is that the first shift, which drops work at 6 o'clock on the Sunday morning, is 24 hours off duty. The second shift, which works from 6 a.m. to 10 p.m., rests 16 hours before resuming their employment on the following day at 2 p.m. The third shift, which begins work on Sunday nights at 10 p.m., has had previously 24 hours off duty. Week by week the men change from the morning to the afternoon, and from the afternoon to the night shift, so that once in every three weeks each individual man does the work enumerated above. The remaining one-third of the men engaged on Sunday labour are not necessarily so engaged during the winter months, but at all times Sunday labour is reduced to its minimum.

Q. Do the men have during the week any corresponding period of rest?—A. The average hours worked on the shifts are eight hours per day, and 56 hours per week. Mechanics and general labourers work nine hours a day, and six hours on Saturday; making 51 hours a week.

Reductions in Price.—The Directors of the Kirkby Lonsdale Gas Company have announced that from the 1st prox. the price of gas for public lighting and motive power will be reduced to 4s. 2d., and for ordinary consumers to 5s. 2d. per 1000 cubic feet. The Hartlepool Gas and Water Company have reduced the price of gas from 2s. 6d. to 2s. 4d. per 1000 cubic feet from the same date.

LAMPLIGHTERS' COMPLAINTS AT NEWCASTLE.

The lamplighters employed by the Newcastle and Gateshead Gas Company have held a meeting for the purpose of "airing their grievances." These, by the way, do not seem to be of a very startling character; but then it is stated that the whole of the men are members of the National Amalgamated Union of Labour. The local delegate of the Union (Mr. Peter Milne) said the men were continually being blamed for breaking the incandescent mantles, when they were really destroyed by people rushing up against the lamps. Reports were given in against the men, it was alleged, not at all according to the rules and regulations which were legally drawn up and entered into between the Company and the men. In these rules, it was stated that the men must hand in their reports not later than 10 o'clock in the morning; but now they had to have their reports in the office not later than 9.30. The men had had no legal notice of this change. He also referred to the fact that one of the men had been dismissed for the paltry offence of not handing in his report one morning; and this after serving the Company well for eighteen years. It would be far better for the men to receive their money directly through the Corporations of Newcastle and Gateshead. They all knew that the Corporations were their real paymasters, and that they paid them through the Gas Company in an indirect manner. What they should do was to pass a resolution, and send it to their Committee. While other speakers were detailing certain alleged grievances, Mr. Milne and two members were sent to interview Mr. Lewis, an official of the Gas Company. On returning, Mr. Milne stated that Mr. Lewis had been seen, and that he had laid the case of the dismissed man before him. Mr. Lewis replied that he had a report to the effect that the man in question failed to report because he was in a public-house, although he would not say that he was under the influence of drink. This and other grievances which he laid before him, were to be investigated by Mr. Lewis. After further discussion, it was agreed that every member should contribute towards making up the wages of the discharged man while the question of his reinstatement was being considered, and that the Company be asked to receive a deputation with regard to the alleged grievances.

THE PUBLIC LIGHTING OF RYDE, ISLE OF WIGHT.

A Liberal Offer by the Gas Company.

At the last Quarterly Meeting of the Ryde Town Council, the question of the lighting of the public lamps was under consideration. The Gas Company had submitted a tender to do the lighting of the western district for £449 5s. 4d., and of the eastern district for £460 17s. 10d. Allowance would be made for moonlight nights; but no discount would be given. In a letter accompanying the tender, the Secretary (Mr. A. E. Coombes) pointed out that it would be impossible to effectively light the town with the existing lanterns and burners. The very best the Company could do under the tender submitted would be unsatisfactory to the Corporation, to the public, and, above all, to the Directors, from whom much would be expected, but whose hands would be tied by the restriction to the use of obsolete appliances. They accordingly offered to provide and fix 280 new lanterns and burners complete, of a pattern which they submitted for approval; the new apparatus to be the property of the Corporation, and the old lanterns to be taken by the Company to cover the cost of removing and fixing. They would supply gas, light, extinguish, and repair the mantles, rods, and burners (including globes and chimneys) to all the public lamps in the borough for three years, for the sum of £3 4s. 6d. per lamp per annum, paid quarterly. Mr. Coombes pointed out that the public lighting last year cost the borough £3 7s per lamp; so that by accepting the Company's offer the Corporation would, at a reduced cost, obtain, during the next three years, an increase of nearly 15,000-candle power for the public lighting, and at the end of the period be in possession of new lamps instead of old ones. The Public Works Committee, who had had the tender under consideration, recommended its acceptance for three years from the 1st prox. Alderman Coombes, in moving the adoption of the recommendation, said the Committee had gone very carefully into this matter, He pointed out that all the new fittings would become the property of the Corporation at the end of three years. The amount paid for gas was £956 in 1899, £947 in 1900, and £971 in 1901. This scheme would cost £979 odd. With regard to the electric light, he pointed out that it would probably be two years before they would have it in Ryde; and the Committee felt that, as they had had such an exceptionally good offer from the Gas Company, they could not do better than accept it. Mr. Stroud seconded the motion. Alderman James supported it; pointing out that if they went on with the old system the cost would work out at £3 7s. per lamp, whereas if they accepted this offer it would only be £3 4s. 6d. per lamp. In addition, they would have 243 new lamps, all incandescent. As the Committee were anxious to get the town nicely lighted, they felt they could not do better than accept the Company's offer. After some conversation, the Committee's recommendation was carried by nine votes to six.

Final Meeting of the Colwyn Bay Gas Company.—On Monday of last week, the sixth annual meeting of the Colwyn Bay and District Gas Company was held—the Chairman (Mr. W. Earp) presiding. In their report, the Directors regretted that this was the last statement of accounts they would have to submit to the proprietors, as the undertaking was purchased by the District Council as from Dec. 31; the purchase-money paid being £54,706, subject to adjustments for stocks and sundry expenses subsequent to the award. Dividends were declared at the rates of 12½ per cent. on the original "A" stock and 8¾ per cent. on the ordinary "B" stock. The balance-sheet showed realizable assets of £72,000; and of this sum, £34,700 was divided between the proprietors in the proportions of £250 for every £100 of "A" stock, and £175 for every £100 of "B" stock. Honorariums were voted to the members of the staff as follows: 300 guineas to the Secretary, 200 guineas to the Manager, 20 guineas to the Auditor, and 100 guineas to the Foreman.

STOCKPORT CORPORATION GAS SUPPLY.

The Management of the Undertaking.

At the Meeting of the Stockport Town Council last Wednesday, the management of the gas undertaking gave rise to a long discussion. The matter came before the members on a resolution passed by the Gas Committee relating to a statement made by Mr. Aldred, a member of the Committee, at the previous Council meeting, as to the "gross mismanagement" of the gas-works. He was asked by the Committee to substantiate his statement; and afterwards a resolution adverse to him was passed. The Chairman of the Committee (Mr. T. Webb), in moving the adoption of the minutes, said Mr. Aldred had several times complained of what he called the gross mismanagement of the gas-works and the small profits obtained from so great a monopoly; and it was in relation to these words that the resolution was passed. Mr. W. Lister having seconded the motion, Mr. Aldred proceeded to address the Council at some length in justification of his criticism. He said he had compared Stockport with 36 other towns, and had found that the average profit was £26,950 per town, against Stockport's £24,685; leaving a debit balance of £2265. The net profits on the turnover were £20,616, while for Stockport they were £11,200, everything included. The capital sunk was £300,000, and they had a profit of £7531 to hand over to the ratepayers, or 2½ per cent. If this was considered good enough for a corporation monopoly, it was not good enough for a private firm. The total make of gas by the 36 undertakings was 77,732,232,800 cubic feet, which, on an average, was three times the Stockport make. On the whole make there was an average leakage of 6 per cent. by the Companies; but the leakage at Stockport was 9·5 per cent., or an excess of 3·5 per cent. He contended that this was a standing piece of gross mismanagement of the works, for by this leakage they were losing £3000 above other towns. He characterized some of the foremen as unintelligent on the authority of the Engineer (Mr. S. Meunier), and protested against him filling appointments without the sanction of the Committee. In conclusion, he submitted that the words he had used were fully justified. Mr. Wood ridiculed the suggestion that the gas undertaking was only paying 2½ per cent. Besides making this profit, the Committee were paying interest to the Corporation at the rate of 3¾ per cent. on the whole of the money invested in the works. Mr. Webb replied fully to the criticisms of Mr. Aldred. With respect to that gentleman's figures, he began with a misstatement, for, although the works were put down at £223,000, he proceeded to value them at £300,000, while all the others he referred to were valued in the same way as those at Stockport. This was not a fair way to make a comparison. He also said that the net profits for the year ending March, 1900, were £7531; but if he would look at the accounts, he would find that they were more than £10,476. If he had gone through everything so very carefully, and was on the Committee where he could have every detail, how came it that he could make such a misstatement as that? Having defended the appointment of a Chemist by the Engineer, Mr. Webb proceeded to deal with the net profit on the capital employed. He said the average rate of interest paid to the sinking funds by the Corporations was 1·75 per cent., while in Stockport they paid 2·89 per cent. This was where the difference came in. If the Corporation of Stockport had paid the average rate to the sinking fund, they would have paid £3107 less, and would have had a net profit of £13,583, instead of £7531 as mentioned by Mr. Aldred. This would bring the net profit on the capital invested up to 6·08 per cent., as against the 4·2 per cent. of the 20 Corporations. So far Stockport management did not show up badly. Mr. Webb went on to compare Stockport with Bolton, and then dealt with the leakage question. He cited places where the leakage was nearly as high as at Stockport, and yet there was no charge of "gross mismanagement." The complaint was due to the original use of wrought instead of cast iron mains; but since Mr. Meunier had been Engineer, he had employed none but the latter. In the year ending March, 1901, they reduced the leakage to 8·92 per cent.; so he thought Mr. Aldred must have referred to their worst year. He concluded by saying he thought the Gas Committee should be given credit for what they did, and not be found fault with by people who did not understand the matter. Mr. Aldred had only been on the Council two years, and therefore was not thoroughly conversant with the subject he had taken up. The minutes were unanimously passed.

ELECTRIC LIGHTING NOTES.

Profits at Worcester.

At the last monthly meeting of the Worcester City Council, the Electricity Committee were warmly congratulated on the success of the past year's working, which showed a profit of £1385 (*ante*, p. 499). A totally different complexion was, however, put upon the case by Mr. Charge, who strongly criticized the whole scheme. The profit, he said, had been made merely by raising the price of the current to consumers, and by the largely increased cost of public lighting. The rates had already been called upon to meet losses amounting to upwards of £4000; and the cost of public lighting was £2000 a year in excess of the cost of gas.

Progress at South Shields.

Some interesting statistics have been published with regard to the municipal electric light works at South Shields, from which we gather that the net loss on the undertaking, from its inception to the end of the last financial year, was £3436. There is something like £1600 in hand at the present time; and the general feeling seems to be that this amount should be used for the purposes of a reserve fund, in order to meet deficiencies which might possibly arise in the future. The average life of the whole of the plant is estimated at about 25 years; and it is expected that in this period the undertaking will have paid for itself. There was a profit last year of £1467; and the Committee do not anticipate any further losses. The past year is the first in which a profit has been made on the works; the losses previously incurred having been as follows: 1897 (seven months only), £2272; 1898, £1675; 1899, £882; 1900, £74; while last year, as already stated, a profit was realized to the extent of £1467. It will thus be seen that the undertaking is making substantial progress.

King's Norton Wise in Time.

The King's Norton and Northfield Urban District Council some years ago obtained an Electric Lighting Order; but instead of immediately carrying it into effect, they have apparently been well considering the chances of success. How much better would it have been for many other local authorities if they had done the same. It was stated that the initial outlay on the installation would be about £20,000, and that a canvass of the householders had had a disappointing result. Under these circumstances, it is hardly surprising that, at a special meeting held recently, the Council decided, by ten votes to five, that, in view of the extraordinary cost of the scheme, and the doubtful possibility of its ever being made a paying concern, they would not expend any money in the provision of electric lighting. Whereupon the "Birmingham Gazette" remarks that the Council "is a body of questionable usefulness," and adds that their "backsliding" can only be attributed to a "craven fear of being great." It seems to us, on the contrary, that the Council are entitled to much credit for refusing, even at the last moment to enter into a gigantic speculation involving, not their own money, but that of the ratepayers over whose interests they are elected to watch.

More Electric Subway Explosions.

Shortly before midnight last Tuesday, some alarming explosions occurred at the corner of Panton and Whitcomb Streets, Leicester Square, owing, it is presumed, to the fusion of the electric wires. The manhole cover was blown off with great force, and the paving-stones near were hurled into the air. The flames appear to have run along the subway in which the wires are laid, and other explosions followed—flames shooting up to a height of 6 or 7 feet. In the Beefsteak Club, which is near the spot, the electric light was extinguished in every apartment; and the Steward at once sent for an electrician. On his arrival, he was shown by an under-porter to the basement. A light was taken, and directly they got downstairs there was a violent explosion, which shivered to atoms all the basement windows, and also broke those on the first landing. A few moments later the members of the Fire Brigade made an examination, and found all the woodwork below stairs to be burning; but they easily succeeded in putting out the flames. The damage was repaired, and the light temporarily restored, by Wednesday morning; the Alhambra being the first building to regain its electric current. According to a representative of the "Westminster Gazette," the corps of electricians which had been at work since three o'clock in the morning at the scene of the disaster were called out of their beds by telegrams and cabs. As this is the fourth occurrence of a similar character within the past fortnight, the employees of the Charing Cross Electric Supply Company are "getting used to turning out suddenly in the night," to use the words of one of the men.

Slackness at Sleaford.

The report presented by the Electric Lighting Committee of the Sleaford District Council on Wednesday last conveyed the gratifying information that the estimated deficiency for the entire year up to September next is £158 19s. 10d. There are now 468 lights connected, irrespective of the public lamps, and 128 more lights to be put on. Mr. Bates expressed his sorrow that there would be a deficiency; but he had always said there would be one the first year, though he hoped it might be avoided. It had been very hard work to get the applications in from the different shops and houses, though he considered the Council had done exceedingly well in such a short time. He hoped the electric light business was not going to be a burden on the rates, or not a success; but having now got their plant, and spent the money, the duty of the Council was to do the very best they could to make it a paying concern. Several who had adopted the light were using gas just the same; and he thought their gas friends had better help them, as they were helped by the electric light. The undertaking belonged to every ratepayer, and they must make it go. He was rather sorry that many who were enthusiastic at the inquiry were not heard of as taking the light. If this was the case, they were letting the Council down; and it was not fair to them. One of the principal objections was to the cost of wiring; if they could get free wiring, plenty of people would take the light. He had no fear of it failing, and this spring they must get all they could to take it, so that when the winter came there would be a paying load, and instead of it being a burden on the rates, it would help them. The report was adopted. Subsequently, Mr. W. B. Harris asked the Committee to consider the matter of wiring consumers' premises and charging them accordingly. There were several people who wanted the electric light, but the cost of wiring was too expensive. If, however, the Committee could spend (say) £200, a good bit of wiring could be done, especially if they employed their own hands. It was done at Walthamstow, and the Local Government Board allowed the Urban Council to do it on their own account, and charge the consumers. He suggested that they should write to the Local Government Board, and ask if they could use some of the last £1000 in the way he had suggested. Mr. Clements said the £1000 could only be used for the purpose for which it was borrowed. The matter then dropped.

Fatal Accident at the Derby Gas-Works.—An inquest was held last Thursday, concerning the death of Harry Copley, a stoker employed at the Litchurch works of the Derby Gas Company. After his usual spell in the retort-house, deceased proceeded to the messroom. On returning to the retort-house after half-an-hour's rest, he took a short cut across the metals in the railway siding; and while passing between two trucks, they suddenly came together. Deceased was caught between the buffers and crushed so terribly that death was almost instantaneous. The Jury returned a verdict of "Accidental death," and recommended that the messroom should be moved to a more convenient part of the premises. Mr. J. Ferguson Bell promised that the recommendation should receive attention.

WATER SUPPLY OF TEIGNMOUTH.

Hitch in the Negotiations with Torquay.

Although more than three months have passed since the Teignmouth District Council decided to accept the offer of the Torquay Corporation to supply the town with water, the two bodies have not yet been able to arrive at a satisfactory form of agreement on the subject. At a meeting of the Teignmouth Council on Tuesday last, Mr. F. Slocombe, Chairman of the Legal Committee, gave a history of the negotiations, which began on Dec. 10 with the receipt of a draft agreement drawn up by the Torquay Water Committee. This agreement differed in three important respects from the terms arranged. First, it did not provide that water should be furnished to Teignmouth for all purposes, but, on the contrary, referred to a supply for domestic purposes only; secondly, it did not provide for a constant supply, but only for a proper and continuous supply *pari passu* with the supply to the Torquay district; and, thirdly, in regard to the charges, it made no mention of any deduction in respect of the rates received for water supply for other than domestic purposes. Another draft was prepared by Counsel at the instance of the Teignmouth Committee; but though there had been interviews and correspondence, the Torquay Committee had not yet given their assent to the agreement in that form. Mr. Slocombe said the original offer of Torquay was to supply them with all the water they required for a rate of 3s. in the pound, and that the Teignmouth Council should regulate the charges for trade and other purposes—the amount received from this source to go in reduction of the 3s. for domestic supplies. Torquay now, however, claimed that any increase in the charges for trade purposes should go to Torquay, in addition to the 3s. rate. The Legal Committee could not consent to this. After full consideration of the whole matter, the following resolution was carried: "That it is useless for the Teignmouth Council to proceed further with any negotiations with Torquay unless the Corporation submit within fourteen days an agreement entirely in accordance with the original terms contained in the correspondence prior to the submission of the draft agreement by Torquay."

THE WELSH WATER SCHEME FOR BIRMINGHAM.

The Estimated Cost.

At the Meeting of the Birmingham City Council last October, the Chairman of the Water Committee (Alderman Lawley Parker) promised that at an early date a report would be laid before the Council, showing as accurately as possible the cost of the works required for the delivery of the first instalment of Elan water in Birmingham. This report was issued to members some weeks ago. It consists chiefly of a document specially prepared for the Committee by the Engineer (Mr. James Mansergh, M.Inst.C.E.), which shows that, whereas the parliamentary estimate for the first instalment was £3,755,350, the present estimate is £5,884,918—an excess of £2,129,568. Of this amount, however, £750,000 is stated to represent the cost of works not included in the original estimates for the first portion of the scheme. The Committee state that the work of preparing the estimate has been in progress, under informal instructions, for a considerable time, but could not be completed until the important question with regard to the filtration of the water at the Welsh end of the aqueduct had been settled. This question has given the Committee very considerable anxiety, and is fully dealt with in their report.

The original intention was only to screen the water at the Welsh end; leaving the entire process of filtration to be done at Frankley. But early in March, 1900, Mr. Mansergh made an important communication. He had learned that great expense and difficulty had been experienced by Liverpool in consequence of a considerable deposit in the conduit conveying the water from Vyrnwy to Oswestry, where it is filtered. On this subject, the following explanation is given: "The discharging capacity of the main between Vyrnwy and Oswestry having become seriously reduced, an investigation had been undertaken by bacteriological and chemical experts to discover the cause, which was found to be attributable to an organism which caused a deposit to take place in the pipes, thereby reducing their delivering capacity. As no such difficulty had occurred in the pipes between Oswestry and Liverpool, it was evident that the organism which caused the trouble was removed from the water in the process of filtration." Before deciding anything, the Committee sent samples of Elan water to Dr. Campbell Brown and Professor Boyce, of University College, Liverpool, and Mr. J. Parry, M.Inst.C.E., Water Engineer of the Corporation of Liverpool. These gentlemen reported that the water contained a precisely similar deposit to that which had created their difficulty. On these reports, Mr. Mansergh advised that the only remedy was to filter the water before it entered the conduit at the Welsh end. After full consideration of the matter, the Committee, much as they regretted the necessity for the additional outlay, felt that they had no alternative but to instruct the Engineer to proceed with the construction of the filter-beds. The estimated total cost of the works in question was £182,350. This wholly unlooked-for development forms an important item in the increased cost of the works.

Coming to Mr. Mansergh's report, which is dated the 10th ult., we find he first of all separates the cost of land, easements, &c., from that of works. He points out that the 1891 estimate for the land of the watershed, the easements for the aqueduct and local works and the land for the Frankley reservoirs and filters, together with the whole of the railways, was £485,257, made up as follows: Watershed, £300,000; easements for aqueduct, £97,680; Frankley reservoirs, &c., £18,000; local works, £5000; add 15 per cent contingencies, £63,102; railways (net), £1475—total, £485,257. The present estimate of the final total cost under these heading is £542,768, which is something under 12 per cent. more than the parliamentary estimate. Mr. Mansergh explains that this sum has been arrived at by the Town Clerk and Secretary, who have carefully considered the details of each uncompleted purchase in the light of the experience of previous purchases, and priced each item to the best of their ability; but they wish it to be understood that the figure is given with all reserve, "as it may be exceeded when the ultimate cost is known."

Mr. Mansergh next submits a tabular statement of the original and ultimate estimates of the cost of the works of the first instalment. From this are extracted the following figures—those in the first column including the addition of 7½ per cent., being half the 15 per cent. provided for contingencies, and £80,000, part of the cost of the Dol-y-mynach dam transferred from the second instalment of the works:—

Description of Work.	Total Original Estimate.	Ultimate Estimate.	Excess.	Percentage of Excess.
Railways, &c.	£48,375	£53,378	£5,003	10·3
Reservoirs and all works other than railways on watershed	761,550	1,517,975	756,425	99·3
Aqueduct — Careg-ddu to Frankley	1,825,350	2,336,316	510,966	28·0
Frankley reservoir and filters	273,292	440,612	167,320	61·2
Mains to Monument Lane and city boundary, cost of reservoirs at Northfield and Warley, and mains from city boundary to service reservoirs . .	228,259	372,140	143,881	63·0
Totals for works . .	£3,136,826	£4,720,421	£1,583,595	50·5

The first item in the above table consists of the railways authorized by the Act of 1892 and the extensions of the main line up the valley required to get the plant and materials to the several works. Mr. Mansergh explains that "the line from the junction with the Cambrian to the Caban was the earliest of all the contracts let, and was completed below the estimate. The extensions have been somewhat longer, heavier, and more difficult than was anticipated, and parts of them were done after the general rise in prices of materials and labour had made itself felt. But I need not say more, as with this item we may all be very well satisfied."

With regard to the second item, Mr. Mansergh says the considerable extra of 99·3 per cent. "calls, of course, for some explanation, which it is not difficult to give." On this matter he says:

> At all the dams we have had to go either deeper in the bottom of the valley or deeper and longer at the ends than could reasonably be anticipated. It was the unanimous opinion of the very experienced engineers and geologists who had the opportunity of examining with me all the sites before the plans were deposited, that I had provided sufficiently for this item. It has turned out differently. At the Caban, for instance, we came upon broken and open-bedded rock on the Brecon side in the up-stream half of the dam site, which took us 20 feet deeper than was expected; and on the Radnor side we met with an extraordinary fissure, which had to be excavated to a depth very much greater. Wherever this extra excavation was needed, the "hole" had, of course, to be filled in with water-tight masonry or concrete at five or six times the cost of the digging. Another great disappointment was the fact that we have not found any stone good enough to build with near the site of any of the dams but the Caban. Another very important cause of increased cost is one that applies to this and every other part of the works, and prevails all over the country—viz., that the wages of all working people have been constantly increasing without a corresponding increase in output. This is operating in every branch of work, so that it has affected not only our own labour costs in the valley, but has enhanced the price of all manufactured goods, such as ironwork, bricks, cement, &c., and of costly plant like cranes, engines, and air-compressing machines, which we have had to purchase.

In explanation of a 28 per cent. excess in the cost of the aqueduct, Mr. Mansergh points out that an obligation was placed upon the Corporation to build one important bridge in stone and brick instead of steel, and also to cross the Severn with one span of 150 feet and the Worcester Canal with one of not less than 100 feet. The first of these bridges, he says, "was in such a position that it was incumbent on us to put up a structure that would not be unsightly, but worthy of the great undertaking of which it forms one of the few exposed features." He adds that, considering its length, no very serious difficulties have been met with in connection with the aqueduct.

The next item dealt with is that relating to the service reservoirs, filters, &c., at Frankley, which shows an excess of 61·2 per cent. Mr. Mansergh is of opinion that the original estimate for this part of the work was too low. It was made by the late Engineer (Mr. Gray), and his colleague was allowed to increase it by £75,000, though this was only about half the addition he then desired to make. Mr. Mansergh goes on to say:

> Mr. Gray also under-estimated the water requirements of the high-level districts, which cannot be supplied by gravitation from Frankley. The whole arrangement for supplying these high-level districts had to be altered in 1896, owing to the enormous growth of the population. Then, as to the yield of water, this was originally set down at 67½ million gallons per day; but it was found that 75 millions could be relied upon, and it was decided to put in all the pipe connections and fittings for half of the 75 millions, as this would avoid much trouble, and effect a material saving of cost in the future. The extra outlay now incurred may therefore be looked upon as an anticipation of works beyond the first instalment, and it accounts for another part of the excess; the rest being due to the enhanced cost of labour, as already explained.

With regard to the local works, on which there is an increase of 63 per cent., Mr. Mansergh points out that he is not responsible for the original estimate. He says the distributing mains as now being laid down are designed to deal with half the water, which he is sure is the best thing to do, as it will postpone for a long time the necessity of breaking up the roads, reduce the number of pipes in the ground, and ultimately result in a saving of expense and a minimum of inconvenience in the city. When all the cost thus involved is set against the original estimate, it shows a large excess; but much of this should, he says, really be regarded as a prudent and justifiable anticipation of outlay on subsequent instalments.

In a table in which Mr. Mansergh summarizes the comparisons

between the original and ultimate estimates, he includes the filter-beds, necessitated by Liverpool's experience (£182,350), additions to the pumping-station at Monument Lane (£25,500), and various other items; raising the excess over the original estimates to £2,049,568, and the total to £5,884,918—the increase being equal to 53·4 per cent. In closing his report, he once more emphasizes the fact that there is, in round figures, the sum of £750,000 for works and land included in the "ultimate" estimate which was not in the "original" estimate for the first instalment.

The Committee close their report with a few remarks on the effect on the rates of the increased expenditure incurred in connection with the scheme. They explain that when it was sanctioned in 1891, a calculation was submitted to the Council and to Parliament, showing that, by increasing the water-rentals at once, the finances of the department would gradually right themselves. This was to be brought about by the creation of a "special water fund," in which the surpluses of the first few years were accumulated to meet the deficiencies of subsequent years until the natural growth of the revenue overtook the adverse balance. The annual increase in water-rentals has been more rapid than was anticipated; and the accumulations reached a total sum of £127,986 at the end of the financial year 1898-9. In the last published account, the credit balance stood at £96,250. But it will now diminish at a much greater rate than was anticipated, by reason of the larger capital sum on which interest has to be paid; and the Committee cannot conceal from the Council that before long some demand upon the municipal rate must probably be made. What the amount will be it is impossible to forecast with anything like accuracy at the present time. They say it will depend largely upon the success of the application now before Parliament for a further suspension of the sinking fund, and upon the cost of operating the new system as compared with the present working expenses of the department. The first point will be determined in a few months; but the second must for some two or three years be a matter of estimate. The Committee see no reason to depart from the original plan of allowing the natural growth of the revenue to gradually adjust the finances, charging the rates only with such an annual contribution as will ultimately ensure this result.

At the Meeting of the Birmingham City Council last Tuesday, the report above referred to was formally submitted.

Alderman LAWLEY PARKER, in moving the adoption of the report, first briefly explained the circumstances under which it was found necessary to provide filter-beds in the Elan Valley at a cost of £182,350, in order to avoid the mischief which had been experienced in connection with the Liverpool scheme through an obstructive growth in the pipe-line, and then passed on to the portion of the report giving a revised estimate of the cost of the first instalment of the Elan supply scheme as compared with the much lower estimate presented to Parliament and to the Council in 1891. He said he had undertaken a very responsible task; but he would remind the Council that it had on several occasions been pointed out by himself, by Alderman Beale, and by Alderman Clayton, that the figures were being exceeded, and that the cost of the scheme would certainly show a large increase on the parliamentary estimates. The Water Committee had also reported to the Council every year what sums had been expended up to the end of the previous twelve months. For instance, in May, 1901, they reported that they had expended up to the end of March, £3,687,500. He submitted, therefore, that the Committee had taken the Council into their confidence in relation to the matter, and that, on the whole, the Council and the ratepayers were not unprepared for something like the increase that was shown in the report now presented. In reply to the question as to how it was that there was so large a discrepancy between the original and the ultimate estimate, he might say, without fear of contradiction, that it was in no way due to the work costing more than it ought to have done. He knew of no mistakes or errors of judgment that had led to any material increase in the cost of the undertaking from beginning to end. The *crux* of the report was found at the point where the ultimate estimate of cost was given at £5,884,918, as compared with an original estimate of £3,755,350; showing an increase of £2,129,558, equal to 53·4 per cent. If they deducted from this amount £750,000 for works not included in the first estimate, it reduced the difference to £1,379,868, which was practically 35 per cent. It might be interesting to the Council to know that of the £5,884,918, the sum actually expended up to the 30th of September last was £4,185,511. Broadly speaking, the excess of cost on the watershed of the Elan Valley works was due to two circumstances. The first was unfavourable geological conditions, entailing a greater amount of work and material for the dams owing to the rock not being sound, and also necessitating that every ton of stone should be carried from the lowest to the highest point—the stone at the latter not being suitable for building material. This was illustrated in the case of the Dol-y-Mynach dam. The original estimate of the cost of so much of this dam as was being now constructed was £80,000; but, owing to the rock not being found on one side of the dam, and to this having in consequence to be lengthened to reach it, the cost was now estimated to be £151,600. It was impossible to have foreseen this. The second circumstance explanatory of the augmented estimate was the great increase that had taken place during the last ten years in the cost of all kinds of materials and of labour, which was a fact so well established that there was no necessity to enlarge upon it. He had heard it suggested that the cost of the Elan Valley works was greater because the Water Committee, with the approval of the Council, decided to carry out these works themselves, instead of having them done by contract. As to this, he had only to state that they acted upon the advice of the Engineer, and in accordance with what had been done in connection with the Liverpool scheme—a precedent that had also been followed in other cases. The Council would have incurred a great responsibility if in this matter they had disregarded the advice of the Engineer, although the Water Committee would thereby have been relieved of a large amount of work. After full consideration, he had no hesitation in saying that the cost had not been greater, in consequence of the work being undertaken by the Corporation, than it would have been if equally good work had been done under contract. He had been able to get some information as to the expense of similar works in relation to the quantity of water impounded. The cost of storage per million gallons varied in the different water undertakings from £53 15s. to £794 6s. 10d.; but the average of 28 other reservoirs was £160 9s. 3d., as compared with which the cost in the Elan Valley was £119 18s. 4d. Turning to the figures relating to the works at Frankley, he admitted that a discrepancy to the extent of 28 per cent. was a large one; but it was mainly due to the increased cost of materials and labour. This also operated in the case of the aqueduct. With regard to the under-estimation of the cost of the Frankley works by the late Mr. Gray, it was only fair to mention that they had not been able to find any specification of how he proposed to do the work. He might have intended to carry it out upon different lines from those adopted by Mr. Mansergh. In conclusion, Alderman Parker explained how careful and minute an account the Committee had kept of the expenditure upon every portion of the work, and contended that, even if the present cost could have been foreseen, the Council would have been obliged to face it if they were to avoid a water famine, with its disastrous consequences to the health, value, and commercial prosperity of the city. There was no question that the Council had been wise in carrying out the scheme; and in years to come advantages would be secured the worth of which it was difficult to estimate, while disaster to the community at large had been averted.

Mr. HALLEWELL ROGERS seconded the motion.

Mr. WALTHALL criticized the report at some length. He said the Corporation were bound to complete this water scheme, and to continue to employ the Engineer until the work was finished; but a gentleman who exceeded an estimate of £3,000,000 by £2,000,000 required watching. His complaint against the Water Committee was that they had not told the Council from year to year sufficient about the work. The present report proved most conclusively that it was wrong to allow any Committee to spend capital money without first coming to the Council with the fullest particulars. He should like to know if the figures now put before them would be repudiated, and if they would be told that geologists and engineers had again led Mr. Mansergh astray. Another important point raised was whether the people in the districts which would be supplied by the Welsh water when it was brought to Birmingham would bear any of the increased cost. Concluding, he said the Council were compelled to vote for the report. But he did it with the greatest reluctance; and he feared that this large increase of £2,000,000 would not be the end of the price they would have to pay.

Mr. W. BARROW inquired whether it was necessary to filter the water at both ends. As there was to be filtration at the Welsh end, could not some saving be made at the Frankley end? Was there any probability of the outside authorities who had the right to claim water doing so, and reducing in some measure the cost to the Birmingham ratepayers.

Alderman BEALE thought one thing of which he had been reminded should be mentioned. The whole point turned upon the error in the forecast of the geological formation of the valley. If this had been as was expected, that great extra would not have arisen, and the addition on the aqueduct would not have troubled them much, because they knew it was really due to the increased price of material and labour. The other matter was, however, most significant. In connection with one of the important contracts, Messrs. John Aird and Sons' original tender included a condition as to the finding of stone on the ground sufficiently good for concrete. Ultimately, that condition was abandoned, and Messrs. Aird took the risk. When the contract was finished, they came to the Committee with an enormous claim for what they described as extras. It was really a demand for the Committee to cover a great loss because, as Sir John Aird put it, they had not found a yard of stone suitable for concrete. When a firm like that made such a mistake, was it not conceivable that an engineer who had only three or four months in which to make his scheme should fall into error?

Alderman LAWLEY PARKER, in reply, said he felt great regret and responsibility concerning the excess; but the one point they had to consider was: Had they spent more money in carrying out this work than they ought to have done? He thought there was no evidence that such was the case. Concerning Mr. Walthall's criticism of the Engineer, he remarked that, although he (the speaker) was not a member of the Water Committee at the time, he had a distinct recollection that Sir Thomas Martineau, the then Chairman, told him that Mr. Mansergh had pressed for a much larger sum on one particular item, for which Mr. Gray was responsible, than had been put down, but he felt that, as Mr. Gray was going to do the work, he had to consent to the estimate. He only mentioned this to show that the matter was before the Water Committee at the time. As far as the present consumers were concerned, the charges were now up to the maximum, and the Town Clerk advised that it was not likely the Corporation would get parliamentary power to charge a higher rate. Therefore, the extra burden would fall on the Birmingham ratepayers, and the people outside would get the benefit of the water without paying any more for it, which was a great shame. It was different, however, with the people who had power to make a claim for water on the line of route. They would be charged *pro ratâ* on the capital outlay. In these cases, Birmingham would get a commensurate return. Mr. Barrow's question was very pertinent. The filtration at the Welsh end was rough filtration, for the purpose of taking out the sediment which caused incrustation in the pipes. If they had originally known what they knew now, they would not have arranged for the same amount of filtration at the Frankley end. At present they had only constructed a portion of the filter-beds at Frankley, and further additions would be considered in relation to the other end. They had had several inquiries for supplies from communities along the line of route, but what would come of them he could not say. Any water they did supply on the way would be profit, and they hoped to get some customers who would help them to bear the burden. He must acknowledge that Mr. Mansergh had been most fair and unselfish in all matters respecting commission. There had not been the slightest effort on his part to make money out of the new works.

The report was then adopted by an overwhelming majority.

The Directors of the Shanghai Water Company, Limited, recommend a final dividend of 32s. 6d. per share for the working of 1901; an interim dividend of 15s. per share having been paid in July last.

WELLS WATER-WORKS PURCHASE ARBITRATION.

Surveyor's Institute.—Monday, Feb. 24.

(*Before* Mr. G. H. Hill, M.Inst.C.E., *Umpire.*)

The arbitration to determine the purchase price to be paid to the Wells Water Company by the Wells Corporation for the acquisition of their undertaking commenced to-day. Mr. Walter Hunter, M.Inst.C.E., was the Arbitrator for the Company, and Mr. G. R. Strachan, M.Inst.C.E., for the Corporation.

Mr. Wedderburn, K.C., and Mr. Hutchinson appeared for the Company; Mr. Freeman, K.C., represented the Corporation.

Mr. Wedderburn, in opening the case for the Company, said these proceedings arose under the Act which was obtained by the Corporation last year. In 1870, there was no water system at all in the district of Wells. The result was that, in 1870, a Company, or a certain number of persons, were incorporated under the Acts of 1862 and 1867; and in November of that year, the Corporation gave their consent to that. In 1871, however, they declined to have anything to do with the water undertaking. The result was that the people who had already incorporated themselves as a Company were memorialized by the public to proceed with their scheme; and they did so. In the first instance, they had some little difficulty in meeting the owners of property where the springs were; but these difficulties were overcome. In 1872, a Provisional Order was obtained, which was the starting really of the Company. Under the Order, they had for their area the City of Wells, which consisted of two parishes—the old Cathedral part, St. Andrews, in the centre of the city, and a parish known as St. Cuthbert's In; and they had also another parish St. Cuthbert's Out. They started with a capital of £5000; and the limit to their maximum dividend was 10 per cent. The Provisional Order made no reference to borrowing powers; and therefore there was no restriction placed upon them. The Provisional Order also fixed the water-rates. The share capital was at once taken up. The sources of supply under the Order were certain springs and water-bearing strata. So that, in fact, they had got underground reservoirs; and the advantage of this was that no over-ground storage was necessary—the storage being behind the source of supply. The Company acquired three springs from Sir Charles Taylor. Having got these springs, the Company's works consisted of a conduit from the spring to a service reservoir, and a further conduit on to the City of Wells. The reservoir contained 150,000 gallons. The supply was started in March, 1873. As regarded the quantity of the water, no question had been raised until within recent years. In 1889, there came the first attempt of the Local Authority to buy them up. The Company were ready to sell, and the Corporation were ready to buy, for the sum of £15,000; but the difficulty that arose was that the Local Government Board declined to sanction the loan, and refused to allow the Corporation to purchase. The matter fell through, and the Company went on. In 1893, they added a new service reservoir at the same spot, containing 220,000 gallons; and they did this at a cost of very nearly £2000, which they obtained by debentures. The reservoir capacity was then 370,000 gallons. Some years of drought occurred; and in 1900 the Company became practically certain that a quite abnormal waste of water was going on among the consumers—the result being that for a time they had to cut off the supply at night. The Corporation objected to this; and the Company replied, pointing out, among other things, that, even with the waste and the times of drought, the position of Wells as regarded the water supply compared favourably with other cities, such as Bath. In September, 1900, the Corporation wrote to the Company and asked them if they were prepared to sell; and they deposited a Bill for the purpose. The Company subsequently reduced the waste from 3400 to 1500 gallons per hour, which meant that, by the methods they adopted, they saved 67,000 gallons per day. During 1901, when exceptional drought prevailed, the Company had overcome the difficulty, because the water was never cut off. In that year, two Bills came before the House of Commons—the Corporation Bill, which had now become an Act, and one promoted by the Company, for additional capital. The House of Commons Committee before whom the Bills came, at once went from detail to the question of principle and policy—as to whether it was a fitting thing that the water undertaking should be in the hands of the Local Authority. The result was that the Company's Bill was never heard, and that of the Corporation was passed. Counsel went on to refer to certain sections of the Act dealing with the sale of the undertaking to the Corporation, and directing that the arbitrators or umpire should allow a sum of 10 per cent. in consideration of compulsory purchase; and he urged that the Corporation would not have to spend money either for laying down further mains or taking up old ones, and that the storage reservoir proposed by them was unnecessary and would be a work of supererogation. There was an ample supply of water from the present existing sources to meet the present demand and the needs for many years to come. Their difficulty had been the question of waste; and the Corporation would have also to meet this difficulty. Counsel next dealt with figures directed to show the steadily increasing business of the Company and their assured income. He incidentally mentioned that, at the present moment, the Company only charged the Cathedral £25 for their water supply, which included the water for the blowing of the organ. In conclusion, he urged that in all these cases the real question to be determined was that justice should be done to the individual shareholder.

Mr. Freeman intimated that one of his chief witnesses—Mr. G. F. Deacon, the principal Engineer—had been suddenly taken with influenza, and could not be present.

Mr. Wedderburn suggested that they should continue the proceedings to-day, and that when Mr. Deacon was able to attend and give his consultative assistance to his learned friend, the latter should be allowed, if he considered fit, to further cross-examine the Company's witnesses.

Mr. Freeman: I think that is a very fair offer.

Mr. *G. M. Taylor*, of Messrs. John Taylor, Sons, and Santo Crimp, Engineers to the Company for new works, was called and gave evidence in detail as to the state of the property, which he held to be in thoroughly good condition. The total value of the Company's undertaking he estimated at £26,911, his basis being 36¾ years' purchase of the maximum dividend, £500, *plus* arrears of dividend, £4364, *plus* £2107 of debentures.

In cross-examination by Mr. Freeman, witness admitted that the basis on which he had valued the concern was about as good a one as he could find; and he thought the security a perfectly good one. He was not aware that in 1893 the Medical Officer of Health regarded the want of a supply of water as detrimental to the public health, nor that in February, 1894, a formal complaint was made by the Town Clerk of the danger and inconvenience caused by the supply not being constant. He was aware, however, that complaints had been made. The storage was ample during the periods complained of; but there had been neglect in checking the waste.

Mr. *Frank Sheldon*, the Resident Engineer to the Company, next gave evidence, testifying that the majority of the mains were in good order. He had heard of complaints in a general way as to the cutting off of the water. Since he had held the appointment, he had taken steps to check the waste.

Mr. *R. E. Middleton*, Consulting Engineer, said he had visited Wells, and inspected the water-works. His conclusion was that there had been an enormous amount of waste, due, to a large extent, to leaking pipes; but the gaugings showed that there was a sufficient supply of water. He agreed with the total valuation of the Company's undertaking at £26,911, which would, in his opinion, be a fair value, having regard to the security.

This terminated the case for the Company.

Tuesday, Feb. 25.

Mr. Freeman opened the case for the Corporation. He said the whole position of the Company was that it was an absolutely perfect concern, with absolutely perfect security. At the same time, they admitted that it might not be called a first-class concern.

Mr. *G. F. Deacon*, the first witness called, said he had made himself acquainted with the Wells water undertaking. He considered that it was worth £11,000, equal to 33⅓ years' purchase. It was not so valuable comparatively as a water company would be in a large centre of population, a large centre of industry, or a watering or pleasure resort.

In cross-examination, witness said he was not aware that the undertaking was considered cheap at £15,000 in 1889. He never heard it suggested. In all cases where he considered the securities were good—such as the Water Companies of Sheffield and Birmingham—he took 33⅓ years' purchase. Then there were additions or deductions to be made, according to whether the company had properties which would enable it to earn a prospective revenue, or was unable to maintain its, net dividend.

In re-examination, witness said that special circumstances in a town or in the works, would make a difference in arriving at a price. A company in a town that had enormous powers of growth should not be treated the same as a company in a town that was stagnant.

Mr. *E. A. Cross*, Mayor of Wells, said the population of the city was not a very rapidly growing one. Practically it was stationary, and under 5000. The Company had turned off the water at night on several occasions, and sometimes they had lowered the pressure during the day. He understood there were times when there was very little water in the reservoirs. Complaints had been made by the Medical Officer; and accordingly the Corporation approached the Company, with the result that in 1896 they constructed an additional service reservoir. The reason why the Corporation desired to purchase the undertaking, was that they wanted a constant supply.

In cross-examination, witness said the sanitary condition of the town had suffered to a great extent on account of the shortness of water.

Mr. *C. B. Newton*, M.Inst.C.E., also gave evidence. He said it was a fact that Wells was stationary so far as population was concerned; but he did not think it possible to supply the city with sufficient water without some storage accommodation. In all properly-equipped water-works, storage was required. He had considered the claim of the Company to pay back-dividends, and he had not allowed anything for them. He thought they could barely earn 10 per cent. Therefore he could see no prospect of their ever paying back-dividends.

Mr. Freeman then addressed the Court on behalf of the Corporation. He said that when his clients offered £15,000 to the Company, they were not acting upon carefully matured advice; and what the Court had now to do, was to ascertain the value of the undertaking to-day, and then add 10 per cent. by reason of compulsory purchase. If they had earned £500 a year in the past, what chance was there of their earning more in the future. Witnesses for the Company contended that the purchase price ought to be calculated on 36·37 years; but he thought there was more reason in the evidence of Mr. Deacon, who put it at 33⅓ years. Complaint had been made that the Company did not supply sufficient water, and yet they took no steps to remedy this. They never once alleged that the waste was caused by the inhabitants until lately; and if, therefore, they had all these years been failing in their duty, then they were not a properly equipped Company. They did nothing serious until it became known that the Corporation were moving. As to their getting back-dividends, they could only do so by starving themselves. He therefore asked the Arbitrators to say that no back-dividends were allowable.

Mr. Wedderburn contended that justice should be done to the individual, by which he meant the shareholders, who had been having 10 per cent. for their money. If the number of consumers was maintained, then the dividends were secure. He contended that the population would not decrease, because, although it was true that it had remained stationary for the last two years, it had doubled itself in a century. Again, there was no reason why a small concern should not relatively be as good as a large one. No water supply was better secured than that which was domestic. In the case of large manufactories, they might fail; but private customers would still go on drinking water. There was no reason why the revenue of the Company, in the hands of the Corporation, should not reach nearly £1000 a year. In the hands of the Company, he believed it might be made to reach £700; and then, of course, they would be able to pay back-dividends.

This concluded the proceedings. The Umpire reserved his award.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

On Monday the Edinburgh and Leith Gas Commissioners met to consider the terms of a Provisional Order they are about to apply for. The principal object of the Order is to provide additional capital. It is estimated that by May 15 the Commissioners will have exceeded their present borrowing powers—of which about £170,000 remained to be exercised at the beginning of the financial year—by £80,054; and it is proposed to take powers to borrow £300,000 to repay the excess and to meet extraordinary expenditure during the next ten years. It is also proposed to seek authority to borrow a further £300,000, to meet the cost of the second section of the gas-works at Granton. The borrowing powers of the Commissioners will then amount to £1,400,000. Of this sum, over £20,000 has been redeemed out of the sinking fund. The Commissioners are making a large demand—larger than would appear to be necessary—because in a few years they will, or ought to, receive very large sums for the sites of their present gas-works in Edinburgh and Leith. Of course, taking the power does not mean borrowing the money; and the largeness of the proposals may be due to a desire to make the financial position of the Commissioners stronger, and to prevent the necessity for further appeals to the Legislature.

Another part of the Order—and the only one which created discussion—was contained in a recommendation by a Sub-Committee, to the effect that they ask power to grant allowances, in their discretion, to aged or disabled employees with a service of not less than twenty years, whom the Commissioners may consider deserving; such allowances not to exceed one-half of the wages paid to the employees at the time they leave the service of the Commissioners. This is a much smaller proposal than the compulsory scheme which was in the air a year or two ago. Mr. John Jamieson, the advocate of the universal scheme, moved that a retiring allowance, in graded proportions, be given to all employees upon weekly wages, who may have reached the age of sixty-five years or who may have been disabled. In the course of the discussion, Mr. Andrew Beveridge, the Parliamentary Agent, said that Mr. Jamieson's scheme would require a very great deal of consideration, and that an actuarial report would be necessary before the sanction of Parliament could be obtained. The recommendation of the Sub-Committee was adopted by a large majority.

Other proposals in the Order are that, deeming it to be inequitable that the inhabitants of Edinburgh and Leith, who are the ultimate guarantors of the gas undertaking, have to pay the same price for gas as consumers outside the boundaries—the expense of supplying outside consumers being further made greater through the necessity of extra pipes, &c.—than the supply to consumers within the boundaries, the Commissioners shall, for not more than ten years from the laying of the extra pipes, &c., be entitled to charge outside consumers 25 per cent. extra for the gas consumed by them; that it be made compulsory upon railway companies or other authorities, when building bridges, to provide culverts to carry gas mains or pipes; and that power be taken to give a differential discount for gas used for motive power purposes. These proposals were agreed to unanimously. The Order has all the appearance of being a good fighting one.

The Corporation of Glasgow are also considering a proposed scheme of superannuation for the employees in their gas-works. A special Sub-Committee upon the subject have had a conference with the Assistant-Registrar of Friendly Societies in Edinburgh; and they recommend the insertion of clauses in a Provisional Order which the Corporation are about to apply for, to enable them to "contribute annually or otherwise, from the revenues received by them, in connection with any of the departments, such sums towards the funds of any friendly society, superannuation, provident, sickness, or other similar fund, that has been or may be instituted for the benefit of the servants, workmen, and other persons employed by the Corporation in such departments."

The Sub-Committee on Contracts of the Glasgow Gas Corporation had before them on the 21st ult. tenders for the supply of 3668 tons of 36-inch cast-iron pipes and special castings for the new gas-works at Provan; and they recommended acceptance of offers by Messrs. R. Laidlaw and Son, of Glasgow, to supply 900 tons at £5 18s. 6d. per ton, and by Messrs. M'Farlane, Strang, and Co., of Glasgow, to supply a similar quantity at £5 18s. per ton. The Gas Committee approved of the recommendation at a meeting on 24th ult.; and at the same meeting they had before them offers by the Compagnie Générale des Conduites d'Eau, Liége, and the Société Anonyme des Hauts-Fourneaux et Fonderies, Pont de Mousson, France, each offering to supply 1971 yards of 36-inch cast-iron pipes at the price of £5 10s. 9d. per ton delivered in Glasgow, without guaranteeing breakages, or £5 15s. per ton guaranteeing breakages. It was moved that fresh tenders be invited for the balance of the supply of pipes required; but, by a majority, the tenders of the two foreign Companies were remitted to the Sub-Committee on Contracts, with power to accept them provided the terms and conditions were found satisfactory. The Sub-Committee met on the following day, and agreed to accept the Belgian Company's offer, subject to the following further stipulations. The sale to be one by sample as well as by description; the Contractors to send to Glasgow not less than six pipes, the contract to be constituted only if and when the Engineer to the Corporation has certified in writing his approval of and satisfaction with the sample pipes; the pipes and special castings to be proved at the Contractors' works, in presence of a person to be appointed and paid by the Corporation; the Corporation to be entitled, in addition, to test in Glasgow, at the cost of the Contractors, not more than 10 per cent. of the pipes; and that all questions between the parties be determined according to the law of Scotland. The money value of the contract is nearly £11,000. The French Company having, in the meantime, found themselves unable to implement the terms of the specification, withdrew their offer; and it was resolved to recommend that fresh tenders be advertised for the supply of the remaining pipes which are required. The subject came before the Corporation on Thursday. Mr. Shaw said he had no objection to foreign competition; but he objected to the Committee, after they had opened two tenders from local firms, proceeding to consider those from abroad.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 620.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 11	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	Jan. 2	5	Australian 5 p.c. Deb..	100—102	..	4 18 0
200,000	5	Nov. 13	6¼	Bombay, Ltd. . . .	6¼—6⅜	..	4 16 4
40,000	5	,,	6¼	Do. New, £4 paid	4¼—4⅜	..	5 9 5
380,000	Stk.	Feb. 13	12	Brentford Consolidated	260—265	..	4 10 7
270,000	,,	,,	9	Do. New . . .	187—192	..	4 13 9
50,000	,,	,,	5	Do. 5 p.c. Pref. .	128—133	..	3 15 2
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb. .	112—115	..	3 9 7
220,000	Stk.	Sept. 12	10	Brighton & Hove Orig.	210—215	..	4 13 0
246,320	,,	,,	7	Do. A. Ord. Stk. .	150—155	..	4 10 4
420,000	20	Sept. 27	10	British.	41—42	..	4 15 3
50,000	10	Feb. 13	12	Bromley, Ord. 10 p.c. .	23—25	..	4 16 0
82,850	10	,,	9	Do. 7 p.c. . . .	18—20	..	4 10 0
500,000	10	Oct. 11	6	Buenos Ayres (New) Ltd.	10—10½	..	5 14 3
220,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	94—97	..	4 2 6
150,000	20	July 17	8½	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
550,000	Stk.	Oct. 11	12	Commercial Old Stock	268—273	..	4 7 11
236,425	,,	,,	9	Do. New do. .	205—210	..	4 5 9
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	,,	9	Continental Union, Ltd.	162—167	..	5 7 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	160—165	..	4 4 10
575,000	Stk.	Feb. 27	5	Crystal Palace Ord. 5 p.c.	120—125*	..	4 0 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	122—127*	..	3 18 9
486,090	10	Jan. 30	10½	European, Ltd. . . .	18½—19½	..	5 7 8
354,060	10	,,	10½	Do. £7 10s. paid	13½—14½	..	5 8 8
15,243,200	Stk.	Feb. 13	4 1/16	Gas-light and Coke	4 p.c. Ord. . .	91—93	+1	4 14 7
					3½ p.c. max. .	89—91	..	3 10 11
					4 p.c. Con. Pref.	110—113	..	3 10 10
					3 p.c. Con. Deb.	92—94	..	3 3 10
2,600,000	,,	,,	3½	Hongkong & China, Ltd.	13—14	..	5 14 4
3,799,735	,,	,,	4	Imperial Continental .	208—211	..	4 14 9
4,193,975	,,	Dec. 13	3	Do. 3½ p.c. Deb. Red.	100—102	+1	3 8 8
70,000	10	Nov. 13	8	Liverpool United A .	227—229*	..	4 7 4
3,800,000	Stk.	Nov. 13	10	Do. do. B .	167—170*	..	4 2 4
473,600	Stk.	Feb. 13	3½	Do. do. Deb. Stk.	118—120	..	3 6 8
561,000	Stk.	Feb. 27	10	Malta & Medn., Ltd. .	4½—5	..	4 0 0
718,100	,,	,,	7	Met. of 5 p.c. Deb.	107—111	..	4 10 1
306,083	,,	Dec. 30	4	Melbourne 4½ p.c. Deb.	103—105	..	4 5 9
75,000	5	Dec. 13	4	Monte Video, Ltd. . .	9—10	..	7 0 0
560,000	100	Oct. 1	5	Newc'tle & G'tesh'd Con.	101—107	..	4 1 9
250,000	100	,,	4½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
541,920	20	Nov. 13	3½	Oriental, Ltd. . . .	7⅝—8	..	5 0 0
1,195,892	Stk.	Feb. 21	4½	Do.	6⅝—7¼	..	4 19 4
346,855	Stk.	Dec. 27	3½	Do.	1¼—1⅝	..	4 11 5
150,000	5	Nov. 28	8	Ottoman, Ltd. . . .	6—6⅛	..	5 7 8
135,000	4½	,,	8		* Ex. div.		
15,000	1	,,	8				
60,000	5	Sept. 27	7				

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
851,070	10	Oct. 11	7	River Plate Ord. . .	10½—11	+¼	6 7 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb..	95—98	..	4 1 8
250,000	10	Sept. 27	8	San Paulo, Ltd.. . .	12—13	..	6 3 1
135,000	Stk.	Sept. 12	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	243—245	..	4 1 8
523,498	,,	,,	10	Do. C	242—244	..	4 2 0
5,850,000	Stk.	Feb. 13	5	South Met., 4 p.c. Ord.	123—126	..	3 19 4
1,627,965	,,	Jan. 16	3	Do. 3 p.c. Deb. . .	92—94	..	3 3 10
380,940	Stk.	Nov. 13	5	Southampton Ord. . .	104—108	..	4 12 7
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	100—102	..	3 17 8
120,000	Stk.	Feb. 27	5⅓	Tottenham and Edmonton A. 5 p.c.	120—125*	..	4 8 0
260,520	,,	,,	4	B. 3½ p.c.	93—98*	..	4 1 8
182,380	10	Jan. 16	5	Tuscan, Ltd.. . . .	7—8	..	6 5 0
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—100	..	5 0 0
230,000	5	Aug. 15	9	West Ham, 10 p.c. . .	9½—10½	..	4 5 9
172,000	10	,,	6	Do. 7 p.c. . .	12½—13½	..	4 8 11
140,900	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
				WATER COMPANIES.			
780,599	Stk.	Dec. 30	11⅓	Chelsea, Ord. . .	305—315	..	3 13 0
150,000	,,	,,	5	Do. 5 p.c. Pref. .	155—160	..	3 2 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—145	..	3 2 1
175,785	,,	Sept. 27	4½	Do. 4½ p.c. Deb. .	142—147	..	3 1 3
1,720,560	Stk.	Oct. 11	8†	East London, Ord.. .	210—2 0	+5	3 16 2
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb. .	143—148	..	3 0 10
1,018,046	,,	,,	3	Do. 3 p.c. Deb. .	97—99	..	3 0 7
700,000	50	Dec. 13	8	Grand Junction 10 p.c. max..	112—117	..	3 8 5
310,000	Stk.	Sept. 27	4	4 p.c. Deb..	127—132	..	3 0 7
708,000	Stk.	Feb. 13	16	Kent	300—310	..	5 3 3
160,000	,,	,,	7	Do. New, 7 p.c. max..	200—210	..	3 6 8
1,043,800	100	Dec. 30	10½	Lambeth, 10 p.c. max..	285—295	..	3 11 2
406,200	100	,,	8	Do. 7½ p.c. max..	210—220	..	3 12 9
350,000	Stk.	Sept. 27	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
500,000	100	Feb. 13	12.5/6	New River, New Shares	405—415	..	3 1 8
1,000,000	Stk.	Jan. 30	4	Do. 4 p.c. Deb..	127—130	..	3 1 7
902,300	Stk.	Dec. 13	7	South-wark and Vauxhall Ord. . . .	190—200	..	3 10 0
126,500	100	,,	7	7½ p.c. max.	180—190	..	3 13 8
489,200	Stk.	,,	5	5 p.c. Pref. .	155—160	..	3 2 6
1,019,585	,,	Oct. 11	4	4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	Dec. 13	10	West Middlesex. . .	285—295	..	3 7 9
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
200,000	,,	Sept 12	3	Do. 3 p.c. Deb. .	96—98	..	3 1 3
					* Ex. div.		

† Next dividend will be at this rate.

It was quite true that the foreign prices were 3s. per ton less than the local prices; but the Corporation had to send someone to Belgium to inspect the pipes, and, besides, after the pipes arrived, they were to be entitled to test only 10 per cent. of them, whereas they were entitled to test the whole of those manufactured in this country. It was explained that, under a minute of the Corporation, dated 1877, the Gas Committee had special power to accept offers without the sanction of the Corporation. Mr. O'Hare, a Labour representative, argued that all firms on the Continent and in America should have an opportunity of offering, because firms at home sometimes took such advantage of the Committee that they had to fall back upon foreign supplies. But he thought that what the Committee had done, even if they believed the home offerers were taking advantage of them, was most irregular. The action of the Committee was, however, approved.

At a meeting of Dundee Town Council on Thursday, a recommendation by the Gas Committee, to the effect that fire-clay retorts should be contracted for, came up for consideration. Mr. High, who is the self-appointed critic of all gas-works affairs, moved that the Council do nothing in the matter except on a plan and specification. Then he launched out upon his now well-surveyed sea of fault-finding. The retorts recently put in, he said, were turning out 2000 cubic feet of gas per ton less than they should; and he reminded the Council that they had expended from £90,000 to £100,000 upon the reconstruction of the gas-works. It was stated by a speaker that the retorts were cracked and broken, as the result of their not having been properly set; and so on. The disposition to complain was abroad. Mr. Ballingall, the Convener of the Committee, said they were now getting 9000 cubic feet of gas per ton of coal. He admitted frankly that about ten days before they were only getting about 8500 cubic feet of gas, and the reason why they did not get a greater volume of gas had not been explained to him. He did not believe it was because the coal was bad, as they never had finer coal than they had received since they appointed the Coal Committee. Probably he was right in believing that, with the view of preventing the escape of smoke from the chimneys, the setting of the retorts had been too finely manipulated. Bailie Stevenson pointed out that on the 14th of December last 496 new retorts were brought into use; that the retorts and the method of serving them were new in Dundee, and men had to be trained to work them; that the above-named date was not a long time back; and that only the two end bottom retorts were damaged, which could be put right for between £200 and £300. Mr. High, in closing the discussion, said he found that there was a difference between the analysis and the gas that was produced. The retorts, he asserted, were not built on Mr. Foulis's plan, but on one from the gas office, with the result that they did not get the gas out of them. He would, however, withdraw his motion, as his purpose had been served. At a later stage of the meeting, it was agreed, on the suggestion of Mr. Urquhart, to ask Mr. M'Crae that, in the report he is preparing, in addition to giving details of expenditure for this year, as compared with last year, he should report upon the construction of the works, the building, the working of the retorts, and the probable causes of the defective production of gas. Mr. High turned up at a meeting of electors of the Fifth Ward on the evening of the same day, and supported a proposal that an independent inquiry by an expert should be held into the condition of the gas-works. There was some wild talk at the meeting, after which the proposal was agreed to.

The visit which was paid to the new gas-works at Granton this afternoon by the Edinburgh Architectural Association was an event of which it may be said that the professional community would be better if there were more. The architectural mind is apt to run in mediæval grooves, and, indeed, there were a few present who thought it was melancholy work to look at machinery and buildings which are mostly steelwork; but they were only a few. All architects cannot find employment in designing magnificent piles of buildings upon classic lines. Bread-winning must be the object of the larger proportion; and, as a study of how to adapt structural means to the productive end in view, it is difficult to conceive that architects could find a better object than in the handsome works which the Edinburgh and Leith Gas Commissioners are erecting to the plans of Mr. Herring, their Engineer.

The Town Council of Aberdeen have this week, after a long discussion upon the recommendation of the Watching and Lighting Committee of the Corporation not to continue the use of the Kitson oil-lamps in Union Street, sent the matter back to the Committee for further consideration. Incandescent gas had no place in the discussion. There is a solid body in the Council in favour of oil lighting. The remainder are mad upon electricity, and are resolved to have it, in reason or out of it. The subject will come up again.

The Town Council of Broughty Ferry on Monday evening formally resolved to proceed with the introduction of an electric light installation, and, by a majority, they resolved that the generating station should be erected on vacant ground at the Corporation gas-works. The intention apparently is that both the gas and electric lighting undertakings shall be under the one management, as it was reported that dual management had not proved beneficial in other places.

The replies of the Edinburgh and Leith Gas Commissioners to the Church of Scotland's Committee regarding Sunday labour in the gas-works are made public (see p. 654). I do not think anyone can say the amount of labour is excessive. The subject is one, however, which is affected in people's minds by considerations religious, political, municipal, and personal; and it is futile to expect general agreement upon it. It is a matter of convenience, and the convenience must be determined according to local requirements. There can be no general rule upon the subject.

Gas-Works Extensions at Rhyl.—A Local Government Board inquiry was held last Friday at Rhyl, respecting an application by the Urban District Council to borrow £6634 for gas-works extensions. Mr. Ellis and Mr. Greenhalgh opposed the application, on the ground that the recent electric light installation would lessen the consumption of gas, and would therefore render the proposed additional gas-works unnecessary.

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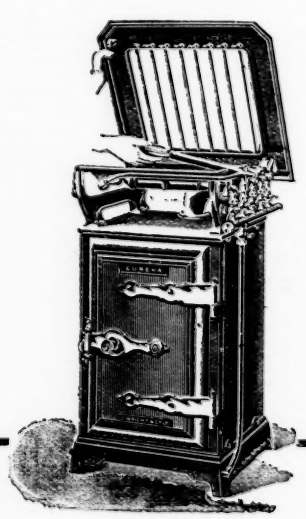

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 8.

Sulphate of Ammonia.

In the early part of the week, there was a considerable amount of selling at a decline on last week's currencies; but, towards the close, there has been more inquiry, and a firmer tone has been imported into the market. The quotations are £11 7s. 6d. per ton f.o.b. Hull, and £11 8s. 9d. to £11 10s. per ton f.o.b. Leith and Liverpool. Consumers are still hanging back; but the heavy shipments in February—some 4500 tons in excess of the shipments in February of last year—have impressed operators who have March contracts to cover, and made them keener about buying than they have been for some weeks past. For delivery over the later spring months, there has been further selling abroad at 2s. 6d. to 5s. per ton below makers' prices, but makers have not thereby been moved from the firm attitude they have consistently maintained since the year opened.

Nitrate of Soda.

This is very firm at 10s. 3d. to 10s. 4½d. per cwt., according to quality; and there has been rather more doing for prompt delivery.

LONDON, *March* 8.

Tar Products.

All the articles are very quiet with the exception of pitch, for which the demand continues very strong. It is very difficult indeed to fix the exact value in London, as there are practically no sellers for prompt delivery. Business is reported for January-June, 1903, by some of the principal London makers; but the price has not transpired. Benzol continues in a very depressed state, and sales of 90 per cent. are reported at 9d. f.o.b. London, while in 50-90 per cent. 8d. has been accepted for home consumption. Crude carbolic continues very firm. A considerable quantity of 60's has been placed at 1s. 11d. up to the end of June, and in one instance a sale at 1s. 11½d. is reported by London makers for prompt delivery. Crystals remain dull; but there is a little business doing in 34-35's at from 6⅛d. to 6¼d., while 39-40's are neglected. Creosote is decidedly easier, business having been done in the North at 1d. for a considerable quantity. The London market is very quiet, and lower prices are likely to prevail. Anthracene is entirely neglected. It is very difficult indeed to fix the value of this article; but "B" 30 per cent. is practically unsaleable, while "A" 45 per cent. is not worth more than 1¾d. per unit.

The average values obtaining during the week are: Tar, 16s. to 19s.; Pitch, east coast, 38s. to 39s.; London, 40s.; west coast, 35s. 6d. to 36s. 6d. Benzol, 90's, 9d.; 50's, 8d. Toluol, 9d. Crude naphtha, 3¾d.; solvent naphtha, 10d. to 11d.; heavy naphtha, 10d. Creosote, London, 1½d.; North, 1d. Heavy oils, 2d. Carbolic acid, 60's, 1s. 10½d. to 1s. 11d. Naphthalene, 40s. to 50s.; salts, 20s. to 25s. Anthracene, "A," 1¾d.; "B," 1d.

Sulphate of Ammonia.

In the early part of the week, the market was very quiet, but closet rather firmer, with a better demand for prompt delivery. It is reported that one of the largest London Companies have accepted £11 6s. 3d. for prompt delivery, but now ask £11 7s. 6d. in any position. Beckton price is still £11 10s. for March, but for April-June £11 7s. 6d. would be accepted. In Leith, there has been a fairly good demand for prompt, £11 7s. 6d. having been paid in more than one instance. The market in Hull is quiet; and there is not a very strong demand for either prompt or forward delivery. For good makes, £11 7s. 6d. has been paid; but consumers are not anxious to purchase at this figure. In Liverpool, prices are certainly easier, especially for early delivery; the demand from this port having fallen off considerably.

COAL TRADE REPORTS.

Lancashire Coal Trade.

If anything, there is perhaps a tendency to shade off slightly in the prices that some of the sellers in the open market are prepared to take for house fire qualities of round coal. Generally, however, the position remains steady, with collieries still moving away practically all they are raising, and with little or nothing now held in stock. Requests for house-fire consumption are naturally falling away; but there is nothing at present in the situation to indicate an early downward move in quoted rates, which remain about 15s. to 15s. 6d. per ton at the pit for best Wigan Arley, 13s. to 13s. 6d. for Pemberton four-feet and seconds Arley, and 11s. to 11s. 6d. for common house coals. With regard to the lower qualities of round coal, inland inquiries for iron-making, steam, and general manufacturing purposes are showing some improvement; and this is steadying prices, which for some time back have threatened to recede considerably during the current year. Representatives of collieries are all talking very hopefully as to being able to maintain something like current rates; and though the market will no doubt be more seriously tested when the gas coal and locomotive fuel contracts come forward, at present there is no disposition to give way to any material extent on the prices now generally ruling. These may be quoted at about 8s. 6d. per ton at the pit for medium, to 9s. for better qualities of steam and forge coal. The best sorts of engine fuel continue in active request; and for these prices are well maintained—Lancashire collieries not quoting under about 6s. 6d. per ton at the pit for good medium, with 7s. being obtained for the best qualities. Even at these figures, there are no plentiful supplies offering; and some of the collieries are short to meet the full requests of customers. The commoner descriptions of slack remain somewhat a drug on the market; and prices are irregular, owing to outside competition. For common Lancashire slack, 5s. to 5s. 6d. per ton at the pit are about average quoted prices, with 3s. to 3s. 6d. representing basis rates for slack at the Derbyshire collieries. The shipping trade has quietened down; and where collieries have to seek an outlet for their common round coal in this direction, they are compelled to give

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SALTLEY WORKS, BIRMINGHAM	2,000,000	YORK	750,000
COLCHESTER	300,000	ROCHESTER	500,000
BIRKENHEAD.	2,250,000	KINGSTON, ONT.	300,000
SWINDON (New Swindon Gas Co.)	120,000	CRYSTAL PALACE DISTRICT	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	DULUTH, MINN.	300,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	CATERHAM	150,000
HALIFAX	1,000,000	LEICESTER	2,000,000
TORONTO	250,000	ENSCHEDE (HOLLAND)	150,000
OTTAWA.	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
LINDSAY (Remodelled)	125,000	BURNLEY	1,500,000
MONTREAL	500,000	KINGSTON-ON-THAMES	1,750,000
TORONTO (Second Contract; Remodelled)	2,000,000	ACCRINGTON	500,000
BELLEVILLE	250,000	TONBRIDGE	300,000
OTTAWA (Second Contract)	250,000	STRETFORD	500,000
BRANTFORD (Remodelled)	200,000	OLDBURY	300,000
ST. CATHERINES (Remodelled)	250,000	TODMORDEN	500,000
KINGSTON, PA.	125,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
PETERBOROUGH, ONT.	250,000	YORK (Second Contract)	750,000
WILKESBARRE, PA.	750,000	ROCHESTER (Second Contract)	500,000
ST. CATHERINES (Second Contract)	250,000	NEWPORT (MON.)	250,000
BUFFALO, N.Y.	2,000,000	TOKIO, JAPAN.	1,000,000

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MALTON, 150,000 Cub. Ft. **GRAVESEND, 300,000 Cub. Ft.** **DULUTH, MINN. (2nd Cont.) 300,000 Cub. Ft.**

way upon recent quotations—10s. 6d. per ton being about the average figure for good steam coals, delivered at Mersey ports. Most of the Lancashire collieries, however, have sufficient inland demand at relatively better prices, so that they are not seeking shipping orders, and there is consequently no large surplus offering at the ports. For coke, a continued good demand is reported, with prices steady at late quotations of about 22s. to 24s. per ton for best Lancashire foundry, 13s. to 14s. for best washed furnace, and 12s. to 13s. for Yorkshire furnace cokes, at the ovens.

Northern Coal Trade.

There have been given out a number of contracts both for gas and steam coals, for shipment over the season; and this has steadied the market. Best Northumbrian steam coals are now quoted at 11s. per ton f.o.b., unscreened steams are dull, and steam smalls are 4s. 9d. to 5s. The collieries have not quite full work as yet; and this has allowed the sale of some cargoes at rather lower prices. The gas coal trade has been stimulated by the giving out of a number of contracts for export to Continental ports. Most of these are on the basis of delivery at the port, so that the price for the coal can only be estimated. As far as can be judged, making average allowances for freight, &c., the rate that is left for the coal f.o.b. at local ports is from 8s. 9d. to 9s. 3d. per ton, so that fair values have been arrived at for summer delivery, if the low current rates continue. For occasional cargoes, Durham gas coal is from 8s. 9d. to 9s. 6d. per ton f.o.b. Coke is in better demand, and is firmer. Export coke is 17s. 6d. per ton, blast-furnace coke 15s., and gas coke rather steadier at from 9s. 6d. to 10s. The stocks of gas coke seem rather smaller.

Scotch Coal Trade.

There is said to be an improvement in the demand for coal; but it has not yet appeared in the prices. Inquiries for forward delivery are, however, getting more plentiful; and the probability is that prices will not go much further down. The quotations are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. to 10s. 9d., and splint 10s. 3d. to 10s. 6d. The exports for the week amounted to 159,583 tons—a decrease of 14,450 tons upon the previous week, but an increase of 10,750 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,447,936 tons—an increase of 94,525 tons upon the same period of the previous year.

Loans for Gas-Works Purposes at Malvern.—The report of the Gas and Water Committee which was adopted at last week's meeting of the Malvern Urban District Council, recommended that application should be made to the Local Government Board for their sanction to the borrowing of £5000 for the purchase of gas cooking-stoves and meters, and £1000 for the coke-handling plant at the Malvern Link Gas-Works, in accordance with the plans, specifications, and estimates submitted by the Gas Engineer and Manager (Mr. H. P. Maybury), and approved by the Council.

Gas-Works Extensions at Spalding.—The Spalding Urban District Council have decided to apply to the Local Government Board for sanction to raise a loan of £3000 for gas-works improvements. The money is to be principally spent on larger mains, as the present ones are not large enough to carry the amount of gas now required.

Swaffham District Council and the Gas-Works.—A special meeting of the Swaffham Urban District Council was held a few days ago, at which was presented the report of a Committee recommending that the Council should purchase the Swaffham Gas Company's undertaking at the price offered—viz., £3000. The structural value of the works, plant, and mains had been valued by Mr. John Young, Superintendent of the Hull station of the British Gaslight Company, on behalf of the Council, at £2553 4s. 10d., and the purchase value at £3919 2s. 1d., exclusive of the value of the powers recently acquired by the Company under their Provisional Order. He reported that the works were in good order; but for their more economical operation and to ensure the best results, he recommended certain additions and alterations. After some discussion, it was decided to arrange for the early purchase of the undertaking.

Serious Accidents at the Malvern Link Gas-Works.—Early last Wednesday morning, a man named Joseph Brooks, who was engaged in fetching empty coke-trucks at the Malvern Link Gas-Works, preparatory to the 4 o'clock draw, by some means fell down the lift, a distance of 25 feet, sustaining severe cuts about the head, and bad bruises on the body. He was removed to the Rural Hospital. This is the second accident that has occurred at the gas-works within ten days. Another employee, named Mark Harman, met with a severe injury to his leg by falling into a hopper; and had it not been for the forethought of a lad named John Marsden (aged 13 years), who stopped the working of the machinery, Harman would probably have been killed. He is at present in the Worcester Infirmary. The little boy, at the last meeting of the District Council, was complimented on his pluck and presented by the Chairman, on behalf of the members, with a guinea.

Leicester and the Derwent Valley Water Scheme.—At a recent special meeting of the Leicester Town Council, the Water Committee reported that they had had under consideration the question of carrying out the works authorized by the Derwent Valley Water Act, 1899, to be undertaken by Leicester. They were of opinion that the time had arrived when the necessary plans and designs should be proceeded with; and they recommended the Council to authorize them to take steps for procuring these and commencing the works. They had also had under consideration the question of the best arrangements for designing and superintending the carrying out of the works, and they recommended that those between Sawley in Derbyshire, where the responsibility of the Derwent Valley Water Board ceases, and Hallgates, and any special engineering works between Hallgates and Leicester, should be carried out by Mr. J. B. Everard, and that the main-laying between Hallgates and Leicester be superintended by the Engineer and Manager of the Water Department (Mr. F. Griffith, M.Inst.C.E.). The report was adopted.

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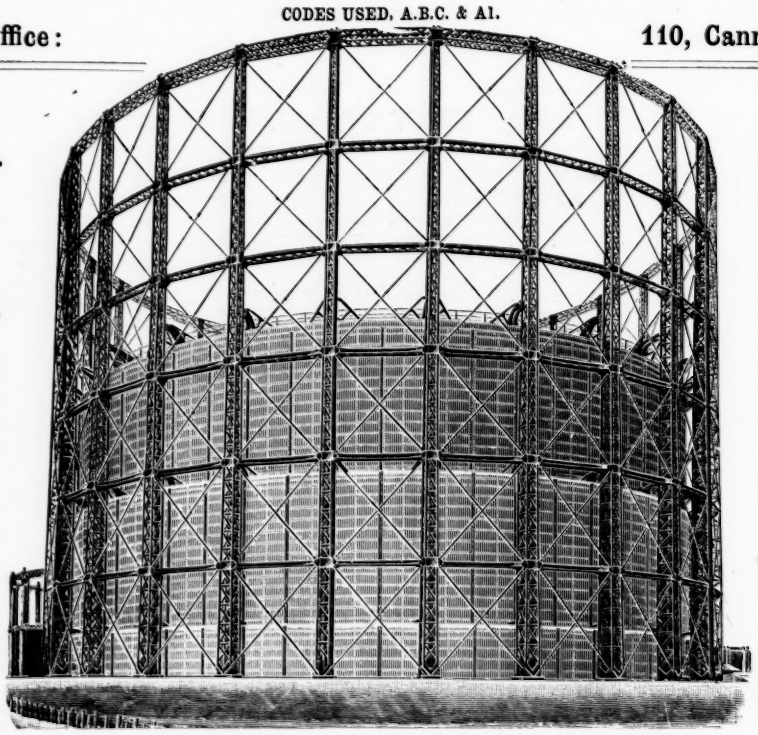

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GASHOLDERS.

British Gaslight Company, Limited.—The Directors of this Company recommend a dividend at the rate of 10 per cent. per annum, for the half year ended Dec. 31, free of income-tax.

Consett and Weardale Water Companies' Amalgamation.—As the result of a long conference, the Directors of the Consett Water Company and the Weardale and Shildon Water Company have decided (subject to the approval of the shareholders and the confirmation of Parliament) to amalgamate the concerns. The basis of the arrangement is that the Consett Company's preference shareholders shall receive an equivalent amount of preference shares in the Weardale Company and the ordinary shareholders an equal amount of ordinary shares. Including additional capital, for which authorization is asked in the Weardale Company's Bill now in Parliament, the joint capital will amount to £1,230,000.

The Output of Coal.—The Home Office has issued an advance proof (subject to correction) of the tables relating to the output of coal and other minerals, and the number of persons employed at mines, of all kinds, worked under the Coal and Metalliferous Mines Regulation Acts, during 1901. From this it appears that last year the output of coal was 219,037,240 tons, against 225,170,163 tons in 1900. The number of persons employed last year was: Underground, 647,822; above ground, 158,913—total, 806,735. In 1900 the figures were: Underground, 624,223; above ground, 155,829—total 780,052. There was thus an increase of 26,683 in the number of persons engaged, of whom 23,599 were employed under and 3084 above ground.

The Shepton Mallet District Council and the Gas Company.—At the meeting of the Shepton Mallet District Council last Tuesday, a report was presented from the Lighting Committee showing that they had come to terms with the Gas Company to withdraw their opposition to the Bill now in Parliament—the Company paying them 100 guineas towards their costs, and they consenting to the bonus capital standing at £4250 (thereby doubling the capital), but the interest on it to be limited to 3 per cent. The additional capital to be raised is to be £6000, instead of £10,000; the standard price 4s. 2d., instead of 4s. 6d. per 1000 cubic feet; and the illuminating power, 14 candles. There is to be no purchase clause; and there will be a few minor concessions on either side. The Council approved the settlement.

Loughborough Gas Supply.—The consumption of gas at Loughborough is rapidly increasing, and threatens soon to outgrow the capacity of the works. It has been a matter of anxiety to the Committee to know how to cope with the additional business. Under these circumstances, a report has been submitted by the Gas Manager (Mr. E. Onions), and adopted by the Town Council, detailing the additions to the plant which are necessary to carry the undertaking over next winter; and the cost of these will be about £400. It will, however, be essential shortly to determine what steps shall be taken to maintain an adequate supply of gas to the town during the winter of 1903-4. Practically all the existing plant (with the exception of the gasholders) will, on the basis of the increase which has occurred during the present season, be working even next year much beyond its recognized limits.

Water-Gas Plant for Barrow.—At a meeting of the Barrow Town Council last week, it was decided to supplement the plant at the gas-works by an installation of carburetted water-gas apparatus, at a cost of £7500. It was stated that the consumption of gas is increasing at the rate of 12 per cent. per annum, notwithstanding the fact that large electric light works have been provided.

Proposed Gas-Works for Silsden.—Mr. E. A. Sandford Fawcett, on behalf of the Local Government Board, held an inquiry at Silsden, last Tuesday, relative to the Urban District Council's application for a Provisional Order empowering them to manufacture and supply gas within their district. The present supply is (and has been since 1876) taken from the Kildwick Parish Gas Company, who sell the gas to the Council in bulk, for distribution for public and private purposes in Silsden. The quantity thus consumed has averaged from 10 to 10½ million cubic feet per annum during the past few years, and has been bought at 2s. 4d., or 2s. 5d. per 1000 cubic feet by the Council, and retailed at 3s. 9d.—leaving a profit of from £100 to £120 per annum. The present agreement between the Council and the Gas Company will terminate on Dec. 31, 1903; and, on the advice on Mr. E. A. Harman, of Huddersfield, the Local Authority have determined to erect gas-works of their own on a site in Low Lane, and supply the township with home-manufactured gas on the expiry of the agreement. The estimated cost of carrying out the scheme is between £6000 and £7000. After hearing evidence, examining the draft Order, and finding that no opposition was raised to the application, the Inspector closed the inquiry and visited the proposed site.

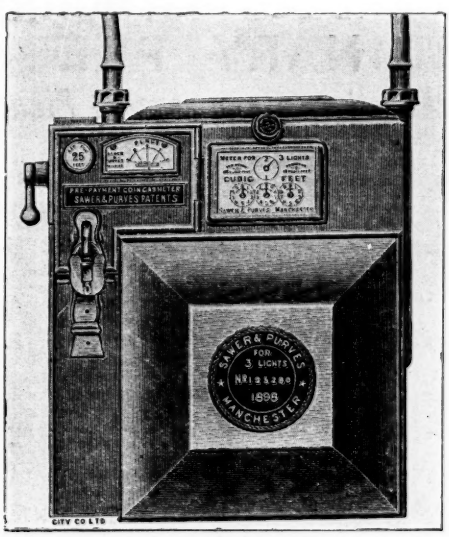
A telegram from New York states that, on Sunday of last week, two buildings were blown to pieces by an explosion of acetylene gas at Reading (Pa.). It is believed that three persons were killed. The damage caused by the explosion amounts to $300,000.

Messrs. J. Walsh and Sons, Halifax, have secured the order for a bench of three beds of regenerative retort-furnaces, on Brearley's patent principle, for the Penistone Gas Company. They have also obtained a repeat order from the Longwood Gas Company for four beds of sevens of the same type.

It will be seen, by an announcement which appears elsewhere, that the Southwark and Vauxhall Water Company are inviting tenders for an issue of 3 per cent. debenture stock, authorized by the Metropolis Water Act, 1899, for carrying out the scheme of intercommunication between the works of the London Water Companies. The stock is redeemable at par, at the Company's option, 25 years from the date of issue. The interest is borne by the eight Companies in varying proportions; and it ranks *pari passu* with the interest on the debenture "B" stock of the issuing Company. The present population served exceeds 800,000; and the gross revenue accrued from water-rents, &c., for the year ended September, 1901, was £306,372, against £215,820 ten years previously. Tenders for the stock must be sent in not later than noon on the 18th inst.

FIRST IN 1889

THE POSITIVE DRY PREPAYMENT METER



FOREMOST EVER SINCE.

SAWER & PURVES,

MANCHESTER.

The Great Grimsby Gas Company have placed the order with Messrs. R. Dempster and Sons, Limited, of Elland, for extensions of their existing condensers.

The Directors of the East London Water Company recommend a dividend at the rate of 8 per cent. per annum for the half year to Christmas last, carrying forward £17,474.

The Gas Committee of the Warrington Corporation have instructed the Gas Engineer (Mr. W. S. Haddock) to consider and report upon the question of obtaining a licence for the manufacture and sale of Mond gas.

The Swadlincote Urban District Council have decided to purchase a piece of land adjoining the gas-works, for the purpose of extensions. They have also accepted the tender of Messrs. C. & W. Walker for a new gasholder at £1808, and for a tank at £1871.

Last Tuesday evening, Alderman T. M. Barron, Chairman of the Gas Committee of the Darlington Corporation, opened an exhibition of gas lighting, cooking, and heating appliances in the Assembly Hall in the town. The cookers shown were those of the Richmond Gas Stove and Meter Company, Limited; and at the conclusion of the opening ceremony Mrs. Middleton gave the first of a series of lectures to demonstrate their value. It was arranged to keep the exhibition open till last night.

An International Exhibition devoted to Commerce, Industry, Science, and the Fine Arts, will be held in Lille, under the patronage of the Municipality, from May 1 to Sept. 15. The exhibits, which will be shown in a building on the Champ de Mars, will be classified in eighteen groups, two of which (Groups 4 and 5) will comprise gas and petroleum engines and electric lighting machinery. In Group 18 will be shown exhibits relating to the application of alcohol for the production of light, heat, and power. In connection with the exhibition, a Technical Committee has been appointed, with M. Albert Dujardin as President. The awards will include grand prize diplomas, diplomas of honour and honourable mention, and gold, gilt, silver, and bronze medals. Applications for space are to be addressed to M. l'Administrateur-Délégué de l'Exposition Internationale, Lille, France.

At the recent annual meeting of the South Hants Water Company, the report presented showed that for the year ending the 31st of December there was a profit balance of £8988, out of which the Directors recommended the payment of dividends for the latter half of the year at the rates of 8, £5 12s., and 4 per cent., which, with the interim dividend at the rates of 7½, 5¼, and 3¾ per cent. respectively, would absorb £8233, and leave a balance of £755 to be carried forward. The Directors stated that during the past year the Company had extended their mains to Brokenhurst, and were in a position to afford a supply to that district. The rent-roll during the year showed an addition of 807 new houses; giving an augmented annual rental of £999. The void properties had decreased from £922 14s. 2d. to £879. The net increase in the year's rental, which included building supplies, was £1269. The report was unanimously adopted.

At the third annual meeting of James Milne and Son, Limited, next Friday, the Directors will report that the net profit for the past year, after meeting all charges, and providing for depreciation, and including the balance brought forward, amounts to £6741, which they recommend should be applied as follows: Dividend for the year at the rate of 5 per cent. per annum on the preference shares, less income-tax, £4719, of which sum £2364 has already been paid as interim dividend; to special reserve fund, against preference dividends, £350—making together £5069.

The amount of coal carbonized by the Blyth and Cowpen Gas Company during the past year was 6030 tons, which yielded 63,980,400 cubic feet of gas—being an increase of 5,711,700 cubic feet. The number of prepayment meters in use at the end of the year was 700, in comparison with 410 at the close of the previous year. The receipts from gas showed an increase of £155; and those from residual products, of £358. The Directors, in the early part of the year, succeeded in securing a satisfactory contract for coal. In justice, therefore, to the consumers, they have reduced the price of gas, which is now at the rate of 3s. 2d. per 1000 cubic feet in the inner radius, and 4s. 6d. per 1000 cubic feet in the outer radius of the Company's boundary, less 5 per cent. discount, provided the accounts are paid on or before a specified date each quarter. The Directors have entered into a contract for the erection of plant to manufacture sulphate of ammonia. The balance standing to the credit of profit and loss account is £3263, out of which sum the Directors recommended dividends of 5 per cent. upon the original capital and 3½ per cent. upon the additional capital.

Last Friday, at the annual concert and ball promoted by the members of the Amateur Athletic Club of Messrs. George Glover and Co., Limited, a silver tea and coffee service (suitably inscribed) was presented to Mr. T. Wright, of Leeds, who has represented the Company for 21 years, and is now retiring from active management of the Leeds branch. Further, Mr. J. W. Slack, who has been appointed to the secretaryship of the allied Companies, was presented by his fellow workers and colleagues with a handsome gold watch, and was asked to accept a gold curb bracelet on behalf of Mrs. Slack. Mr. Slack's promotion has undoubtedly been a popular one with the employees of the Company, as was evinced by the hearty applause when the presentations were made. The Chairman (Mr. E. W. T. Richmond), in the course of a happy little speech, announced that he hoped soon to be in a position to extend the benefits of the profit-sharing system to the employees of Messrs. George Glover and Co., in addition to the stove departments; but he regretted that the present results of the Company were not of a sufficiently prosperous character to warrant it. In a recent issue of the "JOURNAL," it was announced that a system of prizes for "ideas" in connection with the Richmond Company had been started. The first presentation under this scheme was made on Friday to a tinman in the employ of Messrs. George Glover and Co. for an improved cash box for automatic meters. The scheme is reported to have had an excellent effect upon the workmen, and, as a result, five more prizes are to be presented at the profit-sharing distribution at Stratford next week.

WELSBACH

SELF-INTENSIFYING KERN BURNER

Giving a Lighting Efficiency of 300 CANDLES PER BURNER with about 10 Cubic Feet of Gas

AT ORDINARY PRESSURE.

Dispensing entirely with Auxiliary Compressing Plant of any kind whatever.

Specially Suitable for Lighting Large Areas.

The most Economical and Efficient System on the Market.

The Welsbach Shadowless Lantern, with Self-Intensifying Welsbach-Kern Burner.

FOR FURTHER PARTICULARS APPLY TO THE

WELSBACH INCANDESCENT GAS-LIGHT CO., Limited,

PUBLIC LIGHTING DEPARTMENT, YORK STREET, WESTMINSTER, LONDON, S.W.

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COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in Advance. If credit is taken, the charge is 25s. a year.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: Holborn 131.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

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WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston Buildings, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

Telegrams: "ENAMEL." National Telephone 1759.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "C848 BOLTON," or Telegraph "SATURATORS, BOLTON."

Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

BY the adoption of Cripps's Bye-Pass VALVES inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.

Sole Makers: C. & W. WALKER, LIMITED, Midland Iron-Works, Donnington, near Newport, SHROPSHIRE.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PROVINCIAL Gas Companies may profitably consider the advantages offered by ACETYLENE for the PUBLIC and PRIVATE LIGHTING of OUTLYING PORTIONS OF THEIR DISTRICTS, which do not at present justify the expense of laying Coal-Gas Mains from the Central Works.

Correspondence on this subject is invited by the ACETYLENE ILLUMINATING COMPANY, LIMITED, 3, Victoria Street, LONDON, S.W.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

19, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "LUMINOSITY."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

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EERSTE Hollandsche Yzererts Maaty. (The First Dutch Bog-Ore Company, Limited), ROTTERDAM.

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JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

PREPAYMENT METER WORK.

CONTRACTS are undertaken by William EDGAR for FITTING UP HOUSES complete with the PENNY-IN-THE-SLOT INSTALLATIONS. Gas Companies or Corporations indemnified against loss through Accidents, &c. Thousands of Houses have been fitted up by me under this System. Estimates free.

BLENHEIM HOUSE, 23, Lower Mall, HAMMERSMITH.
Telegrams: "Gasoso."
Telephone No. 14, Hammersmith.

CHEMIST and Assayer (M.A. Cambridge, Royal College of Science, A.I.C., F.C.S.), seeks appointment as a PRACTICAL CHEMIST in one of the Chemical Industries either as Assistant or Research Chemist. Has had considerable experience, including Gas and Water Analysis. Disengaged shortly.

Address "CHEMIST," care of G. W. Byrne, Esq., Solicitor, 14, Bell Yard, TEMPLE BAR, W.C.

GENTLEMAN, who is a good ACCOUNTANT and thoroughly understands SECRETARIAL duties and general work of Gas Office, possessing full knowledge of GAS STOVE and FIRE DEPARTMENT, seeks re-engagement.

Address No. 3800, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, several good all-round GAS-FITTERS. State Experience, Wages, and References. Permanent job.

G. STEVENSON, Gas-Works, LONG EATON.

WANTED, a Gas-Fitter. A thorough good hand at Iron and Compo. Work for Internal Fittings. Permanent work for suitable Man.

Apply, by letter, stating Wages required and Reference, to the MANAGER, Gas-Works, Romford, ESSEX.

WANTED, a thoroughly efficient RETORT-HOUSE STOKER. One accustomed to Engine and Exhauster.

Apply, by letter, stating Height and Age, and giving Reference to recent Employer.

Address the MANAGER, Gas-Works, Romford, ESSEX.

WANTED, for Cape Town, Two Main-LAYERS. Wages £3 per week. Single Men preferred.

Apply, by letter only, to "GAS" care of Burbidge, Wilcox, and Co., 62, MOORGATE STREET, E.C.

WANTED, immediately, an experienced STOKER, used to Shovel Charging and Engine and Exhauster. Must be steady and reliable. Wages 35s. per week.

Apply to MANAGER, Gas-Works, SUNBURY-ON-THAMES.

HARTLEPOOL GAS AND WATER COMPANY.

DISTRIBUTING FOREMAN.

WANTED, by this Company, a thoroughly PRACTICAL MAN (Plumber preferred), to take charge of the FITTING DEPARTMENT, both Gas and Water. He must possess a good knowledge of distribution, and be able to take charge of workmen and advise consumers.

Wages 45s. per week, with free House, Firing, &c.

Applications, with three recent testimonials, to be sent addressed to THOS. BOWER, Engineer and General Manager, Gas-Works, WEST HARTLEPOOL.

COAL GAS TAR wanted.

State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, Tar Distillers Sharpness Docks, GLOS.

Telegrams: "BALEFIRE LONDON."

BALE & CHURCH, Late of Bale & Co., OXIDE of IRON, METERS, FIRE-CEMENT, PAINT, &c.

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TO GAS AND WATER OFFICIALS.

HIGH CLASS CYCLES at lowest Prices guaranteed and sent on APPROVAL for Cash or GRADUAL PAYMENTS. Catalogue and Testimonials from Gas Managers post free.

MELROSE CYCLE COMPANY, COVENTRY.

GAS-FITTER wanted, well-up in Iron and Compo. and Service Laying. Permanency to a good all round man.

State Wage required and previous Employment to No. 3831, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a thoroughly reliable and experienced GAS-FITTER by a Provincial Gas Company. He must understand the fixing of Cookers, Fires, and Meters.

Apply, by letter, to No. 3833, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C, giving Particulars of Wages required and Experience.

CITY OF BIRMINGHAM.

(GAS DEPARTMENT.)

SUPERINTENDENT required for the Swan Village Works. Annual make about 450 million cubic feet. Commencing Salary £475.

Apply, by letter only, on or before March 17, stating Qualifications and enclosing References, to Mr. HENRY HACK, the Engineer, at the City Gas-Works, Saltley, BIRMINGHAM.

COUNTY BOROUGH OF STOCKPORT.

DRAUGHTSMAN.

THE Gas and Electricity Committee are prepared to receive APPLICATIONS for the position of DRAUGHTSMAN.

Candidates must have a thorough knowledge of Building Construction and Iron Structures.

Address, stating Age, Salary, and Past Experience, to the CHAIRMAN, Gas and Electricity Offices, Portwood, STOCKPORT, on or before the 19th of March next.

WANTED, by the Gas Committee of the Urban District Council of Newry, a competent GAS ENGINEER, to inspect and report on the existing state of the Newry Gas-Works, making a thorough Examination of the Carbonizing, Purifying, and Distributing Plant, and advising generally thereon, with the object of improving the present method of manufacturing Gas and the treatment of Residuals.

Applicants to state Qualifications, Reference, Terms, &c., addressed to THOS. P. LEDLIE, Esq., Chairman, Gas Committee, Town Hall, NEWRY.

COUNTY BOROUGH OF WARRINGTON.

WANTED, by the Gas Committee, an experienced ASSISTANT GAS ENGINEER. Salary £150 per annum.

Applications, accompanied by *copies* of Three recent Testimonials, addressed to the Town Clerk, Warrington, must be sent in not later than Thursday, the 3rd of April, 1902.

Canvassing directly or indirectly will disqualify applicants.

J. LYON WHITTLE,
Town Clerk.

Town Hall, Warrington.

CITY OF LEEDS.

THE Gas Committee require the services of an ASSISTANT to the Superintendent of the Mains and Services Department.

Applicants must possess a thoroughly practical knowledge of Main and Service Laying and the Distribution of Gas. Salary £130 per annum.

Applications, stating Age, and Experience, with *copies* of not more than Three recent Testimonials, and addressed to the undersigned, endorsed "Assistant, Mains Department," will be received not later than Saturday, the 22nd inst.

Canvassing Members of the Corporation will disqualify Candidates.

W. J. JEEVES,
Town Clerk.

March, 1902.

GAS Plant for Sale—63 Mouthpieces (Tangye's), Ascension-Pipes, Dip-Pipes, Mains, Tar-Boxes, Condensers, Exhausters, Pumps, Engines, Scrubber and Washer, Purifiers, Oil, Naphtha, and Pitch Stills, Condensers, and Receiving-Tanks.
Write W. BLACK, Stanrigg, AIRDRIE.

LEIGH CORPORATION GAS-WORKS.

FOR SALE—Four 18 feet square PURIFIERS, complete with 18-inch dry-faced Four-Way Valve and Connections, including lifting tackle.
Further particulars may be obtained from the ENGINEER and MANAGER, Gas-Works, Leigh, LANCS.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

CHESTER UNITED GAS COMPANY.

FOR SALE—40,000 per hour Reciprocating EXHAUSTER and ENGINE by R. Dempster and Sons, in first-class working condition. Discarded to make room for larger one. Can be seen at work by appointment, or photo. sent.
Apply to J. C. BELTON, Engineer, Gas-Works, CHESTER.

MERTHYR TYDFIL GAS COMPANY.

FOR Immediate Disposal, Complete SULPHATE PLANT in First-Class condition. Can be seen at any time by appointment. Extensions the cause of disposal.
Further Particulars from the Manager.
Gas-Works, Merthyr Tydfil,
March 4, 1902.

TO BE SOLD—
GASHOLDER, Two-Lift 45 ft. by 14 ft. = 42,000 cubic feet capacity.
CENTRE-VALVE, 15 in. diameter, by Walker, for Four Purifiers.
Four PURIFIERS, 10 feet square, in line, with Planed Joints, Walker Centre-Valve, Covers, and Traversing Crab Lifting Gear. Will be refixed equal to new.
Write J. WRIGHT, Bridge House, BLACKFRIARS, E.C.

GAS FACTORY, ROYAL ARSENAL, WOOLWICH.

THE following plant is offered for Sale—
Five 12 feet square Cast-Iron GAS-PURIFIER BOXES and Wrought-Iron COVERS.
14 10-inch RACK and PINION VALVES.
Two CRANES, hand-lifting, for above covers.
The Purifiers, &c., must be disconnected and removed at the purchaser's expense, but the earthwork will be cleared by the War Department.
Further particulars can be obtained on application at the Building Works' Office, Royal Arsenal, Woolwich.
M. T. SALE, Colonel (Ret.),
Supt. Building Works.
Royal Arsenal,
Feb. 27, 1902.

RETORT CARBON.

TENDERS invited for about 20 Tons.
T. E. STILLARD, Gas-Works, DUDLEY.

CITY OF LEEDS.
(GAS DEPARTMENT.)

TENDERS FOR DRY GAS-METERS.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the supply of DRY GAS-METERS, to be delivered at their Meter-Store during a period of Twelve Months from receipt of order.
Each party tendering is required to send, on or before Monday, the 17th inst., Two samples of 3-Light Meters (one of which is to be left open for examination), addressed to the Gas-Meter Works, Meadow Lane, Leeds.
Forms of Tender may be obtained on application to the undersigned, at the Offices of the Gas Department, Municipal Buildings, Leeds.
Endorsed Tenders, addressed to the Chairman of the Gas Committee, at the latter address, will be received not later than Monday, the 24th inst.
The Gas Committee do not bind themselves to accept the lowest or any Tender.
R. H. TOWNSLEY,
General Manager.
Municipal Buildings, Leeds,
March 7, 1902.

LEEDS CORPORATION GAS-WORKS.

TO OIL IMPORTERS AND OTHERS.

THE Gas Committee of the Corporation of Leeds are prepared to receive TENDERS for the supply of about 6000 Tons of GAS OIL, for the manufacture of Carburetted Water Gas, delivered free by rail in Tank-Waggons to the Gas-Works Sidings, Hunslet Lane, Leeds, during the Two Years ending the 30th of September, 1904.
Specification and Conditions of Tender can be obtained on application to the undersigned.
Tenders and Samples, addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, and endorsed "Tender for Gas Oil," must be delivered on or before Tuesday, the 25th inst.
The Committee do not bind themselves to accept the lowest or any Tender.
R. H. TOWNSLEY,
General Manager.
Municipal Buildings,
Leeds, March 8, 1902.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for their surplus TAR for Twelve Months from the 25th of March next, at per ton delivered into Contractor's tanks at the Company's Works.
Sealed Tenders, endorsed "Tenders for Tar," will be received by the undersigned on or before Saturday, the 22nd of March next; but the Directors do not bind themselves to accept the highest or any Tender.
By order,
W. A. PADFIELD,
Engineer and Secretary.

COUNTY BOROUGH OF SALFORD.

THE Gas Committee invite Tenders for the supply of about 1100 Tons of LIME required for the Purification of Gas at their respective Stations during the Twelve Months from date of acceptance of Tender.
Full Particulars may be obtained from the Gas Engineer, Broom Street, Salford.
Sealed Tenders, endorsed "Tender for Lime," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m., on Thursday, the 20th of March, 1902.
L. C. EVANS,
Town Clerk.
Town Hall, Salford,
March 8, 1902.

BOROUGH OF NELSON.

THE Gas Committee invite Tenders for the Supply and Erection of the following Plant at their Brierfield Works:—
(a) SULPHATE of AMMONIA PLANT.
(b) SATURATOR and LEADWORK.
(c) Overhead CAST-IRON CISTERN, 56 ft. 6 in. by 46 ft. 6 in.
(d) STEEL GIRDERS and STANDARDS.
Prints, Specifications, and Form of Tender of each item, together with all Particulars, may be obtained upon application to Mr. A. J. Hope, Engineer, Gas-Works, Nelson, upon payment of One Guinea, which sum will be returned upon receipt of *bonâ-fide* Tender.
Tenders to be delivered to the undersigned not later than Wednesday, the 19th of March, 1902.
The lowest or any Tender not necessarily accepted.
J. H. BALDWICK,
Town Clerk.
Town Hall, Nelson,
Feb. 25, 1902.

BOROUGH OF NELSON.

THE Gas Committee invite Tenders for the Supply of
(a) BRASS FITTINGS, and
(b) CAST-IRON PIPES and SPECIALS,
required for the ensuing Twelve Months.
Form of Tender, with particulars, can be had on application to Mr. A. J. Hope, Gas Engineer, and Samples may be seen at the Gas-Works.
Sealed Tenders, duly endorsed, must be sent to me, the undersigned, not later than the 21st of March.
The lowest or any Tender will not necessarily be accepted.
J. H. BALDWICK,
Town Clerk.
Town Hall, Nelson,
February, 1902.

BOROUGH OF WORKINGTON.

TENDERS FOR GAS COAL.

THE Gas Committee of the Workington Corporation invite TENDERS for the supply, in whole or in part, of 12,000 Tons of good GAS COAL, to be delivered free, in quantities as required, at the L. & N.W. Rly. Station, in flat-bottomed Waggons, or at the Quay Side, Workington, between the 1st of April, 1902, and the 1st of July, 1903.
Tenders, specifying the Description and Quality of Coal, Analysis of same, the Pit at which it is raised, and the Terms for net monthly payment, are to be sent on or before the 17th of March, 1902, to the undersigned, endorsed "Tender for Coal."
Any other Information required may be obtained on application to Mr. George Keyte, Gas Engineer, Gas-Works, Workington.
The Committee reserve the right to divide the above quantity into two or more Contracts.
The lowest or any Tender not necessarily accepted.
JOHN WARWICK,
Town Clerk.
Town Hall, Workington,
March 6, 1902.

LIVERPOOL UNITED GASLIGHT COMPANY.

TAR.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the TAR produced at their several Works for a period of One Year, from July 1, 1902.
The quantities of Tar produced per annum are estimated to be as follow; but the same cannot be guaranteed, and may be more or less:—
At the Athol Street Works, about 510,000 gallons.
" Eccles Street " " 500,000 "
" Caryl Street " " 350,000 "
" Wavertree " " 520,000 "
" Linacre " " 2,000,000 "
" Garston " " 350,000 "
The Tenders may be for the whole, or for one or more of the Works separately, or for a definite quantity from Linacre Works.
Forms of tender and full particulars may be obtained on application to the undersigned.
Tenders, sealed and endorsed "Tender for Tar," are to be delivered here not later than the 21st of March, 1902.
The Directors reserve to themselves the right to accept any tender in part or in whole, and do not bind themselves to accept the highest or any tender.
By order,
WILLIAM KING,
Engineer.
Gas Office, Duke Street,
Liverpool, Feb. 27, 1902.

TUAM GAS-WORKS.

TENDERS are invited for the Construction and Erection of a new GASHOLDER of Steel, 40 ft. diameter by 12 ft. deep, and the building of a CONCRETE TANK for same.
Tenders, accompanied by complete Specifications and Drawings, by March 25, to the undersigned, from whom any Particulars required may be obtained.
FRANK BROWNE,
Manager.
Gas-Works, Tuam,
Co. Galway, March 4, 1902.

THE Directors of the Bridport Gas Company, Limited, are open to receive OFFERS for the supply and erection of a MECHANICAL WASHER-SCRUBBER also a TAR-EXTRACTOR (either new or second-hand), capable of dealing effectively with 10,000 cubic feet of Gas per hour.
Send full Particulars of the Apparatus offered to the undersigned not later than the 31st of March inst.
J. H. CORNISH,
Secretary and Manager.
Bridport, Dorset,
March 8, 1902.

COMMERCIAL GAS COMPANY.

TENDERS are invited for the supply of GAS MAKING OIL for Twelve Months from June 30, to be delivered at the Company's Works, Stepney, Wapping, and Poplar.
Particulars of the Deliveries, &c., to be furnished on application to the Company's Engineer, Mr. H. E. Jones, Gas Office, Stepney, E.
Tenders to be sent in on or before Wednesday, the 19th inst.
The Company will not be bound to accept the lowest or any Tender.

TENDERS are invited by the Municipal District of Lismore for supplying one standard GASHOLDER, Size (say) 50 ft. by 15 ft. with 9-inch Inlet and Outlet Pipes, Duck Feet, Bends, Syphons, Valves, &c., also One 9-inch Improved Gas Governor with Bye-Pass Valve and Fittings, all complete. Also Plan and Specification for the above and for Concrete Gasholder Tank.
Tenderers to state price f.o.b. England, and to reach Lismore not later than the 30th of April next ensuing, and to be addressed Municipal District of Lismore, New South Wales, Australia.
Reference, Bank of New South Wales, London.
C. A. BARHAM,
Council Clerk.

BOROUGH OF MACCLESFIELD.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months commencing the 1st day of May next.
Tenders for the Tar or Liquor separately to be sent in not later than Tuesday, the 18th of March, 1902, addressed to the Chairman of the Gas Committee, Town Hall, Macclesfield, and endorsed "Tender for Tar," &c.
For Conditions, apply to Mr. Newbigging, Engineer, Gas-Works, Macclesfield.
The Committee reserve to themselves the right of accepting any Tender for the Tar or Liquor separately.
The highest or any Tender not necessarily accepted.
ARTHUR T. PATTINSON,
Town Clerk.
Feb. 19, 1902.

THE Corporation of Middleton are pre- pared to receive TENDERS for SUNDRY STORES for the Year ending the 31st of March, 1903, consisting of the following: LIME, VITRIOL, METERS, BRASS MAIN COCKS, TUBES and FITTINGS, OILS (Gas-Engine, Cylinder, Engine, Boiler, Exhauster, and Conveyor Lubricant); and also for the purchase of the surplus TAR made at their Gas-Works during the same period (about 700 Tons) and BENZOL.
Further Particulars, Specifications, and probable Quantities may be obtained on application to Mr. E. E. J. Anderson, M.I.M.E., Gas Engineer.
Tenders, addressed to the Chairman of the Gas, &c., Committee, endorsed "Tender for Sundry Stores" or "Tar" or "Benzol" as the case may be, must be delivered at my Office on or before Thursday, the 27th of March, 1902.
The Corporation do not bind themselves to accept any Tender.
FREDERICK ENTWISTLE,
Town Clerk.
Town Hall, Middleton,
March 5, 1902.

URBAN DISTRICT OF MILFORD HAVEN.

TENDERS FOR GAS COAL.

THE Milford Haven Urban District Council are prepared to receive TENDERS for about 800 Tons of large GAS COAL, about 50 Tons of CANNEL COAL, and also about 120 Tons of BITUMINOUS STEAM COAL, to be delivered between the 1st of April, 1902, and the 31st of March, 1903. The whole of the Coal to be fresh Hewn, Clean, and free from Impurities.
Further Particulars and Forms of Tender can be obtained on application to the undersigned.
Sealed Tenders, endorsed "Tenders for Coal," addressed to the Chairman, Gas and Water Works Committee, to be sent in not later than the 17th of March next.
The Council do not bind themselves to accept the lowest or any Tender.
By order,
THOMAS H. LEWIS,
Clerk.
Milford Haven,
Feb. 28, 1902.